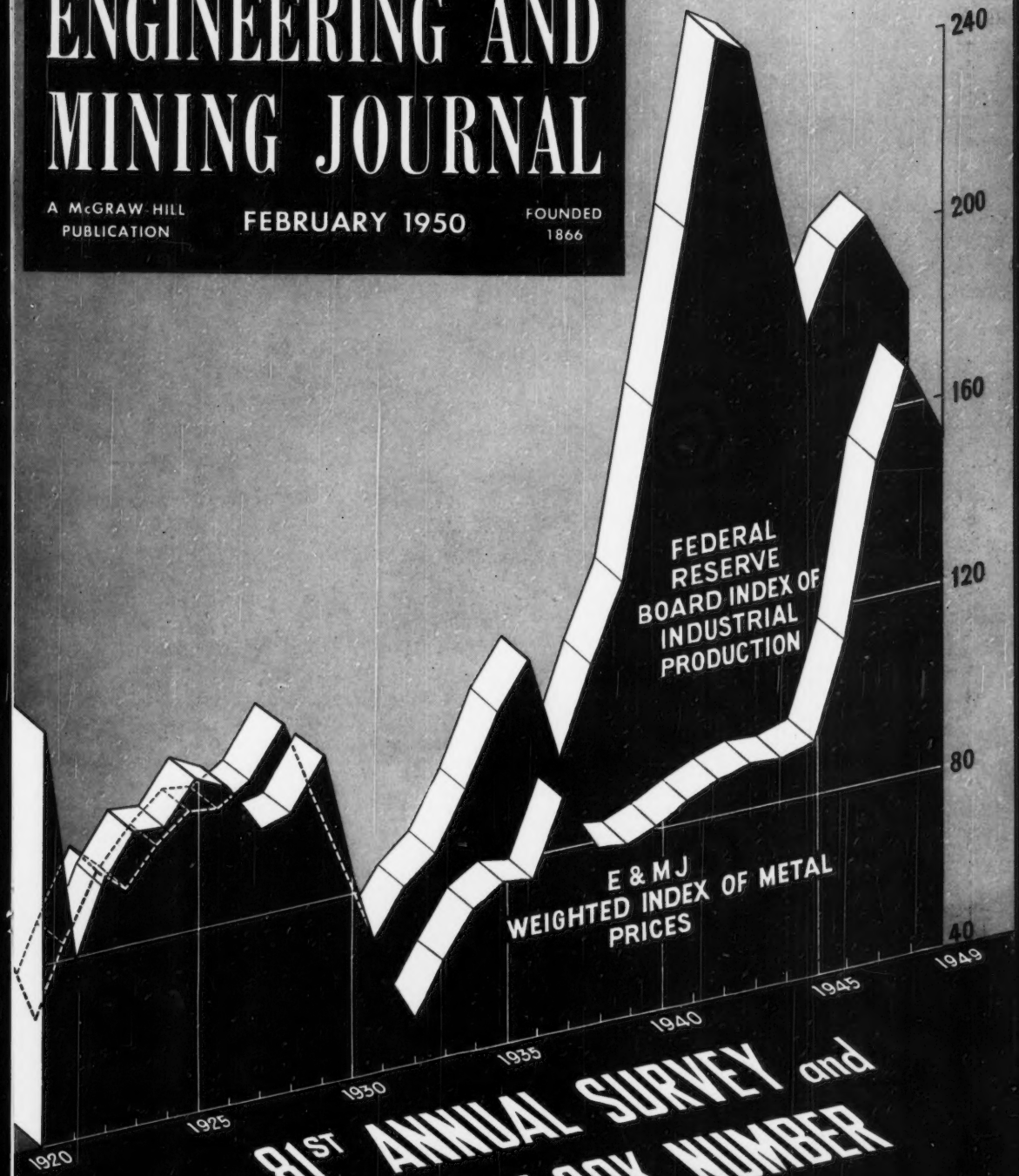
ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

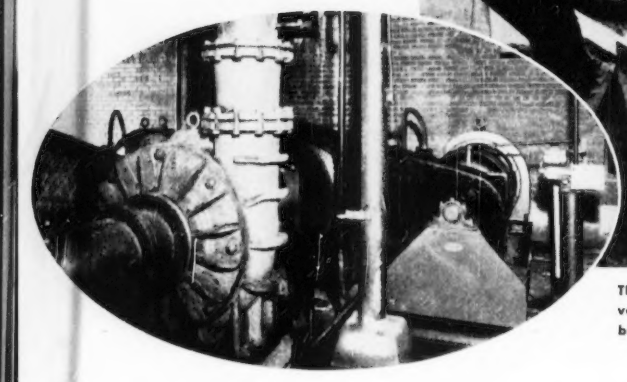
FEBRUARY 1950

FOUNDED 1866



81ST ANNUAL SURVEY and OUTLOOK NUMBER

Steel Producer Again Selects HYDROSEALS for Materials Pumping



The Hydroseals, located below the floor, pump tailings through the three 12" vertical pipes, shown above, to elevated launder for gravity flow to other buildings for further processing. One of Hydroseals is shown at left.

Three Hydroseals are handling large quantities of mill tailings in the iron ore concentrating plant of a large steel producer. These join other Hydroseals that have been solving the company's materials handling problems for years. In this latest installation, there's more to it than just three Hydroseal pumps. This is a specially designed "pumping system" with one variable speed unit to compensate for slight changes in volume in the sump and minor changes in head. The pump shown above, left, is driven through a variable speed hydraulic coupling, the output speed of which is controlled from the liquid level of the sump through an air probe submerged in the sump (white arrow in photograph, above right, points out pipe for air probe). A second pump operates at a constant speed while the third is a standby unit. This is but one of the many control systems engineered for use with Hydroseal pumps. If you, too, have a materials pumping problem, it's more than likely that we have the solution for you. Catalog on request. Allen-Sherman-Hoff Company, 229 So. 15th St., Philadelphia 2, Pa., U. S. A. Representatives in Most Principal Cities.

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This chart will help you pick

THE RIGHT JACKHAMER

for any job

In a pinch almost any size Jackhamer can be used to do a rock drilling job at hand, but the thing to bear in mind is that the real payoff, in around-the-clock or shift drilling, comes when a Jackhamer of the *correct weight and power* is applied to the job to be done. Any sizeable operation calls for more than one type and size of drill. This is especially important today, because under present conditions a Jackhamer properly applied pays for itself in half the time it did ten years ago.

Ingersoll-Rand offers you the most complete and finest line of Jackhamers available. The handy chart below will help you select the right Jackhamer for each of your jobs.

		WEIGHT	LENGTH	APPLICATIONS
	J-50	62½ Pounds	23⅛ Inches	If it's straight down hole heavy-duty drilling, use the J-50. It is best suited for shaft sinking, excavation, road building and quarry work where holes up to 20 feet in depth are needed in all kinds of rock formations. Many users are also finding the J-50 excellent as a light drifter when long feeds and Carset Jackbits are used.
	J-40	53 Pounds	22⅜ Inches	Where a lighter weight Jackhamer with plenty of power is required, use the J-40. It readily handles jobs such as heavy duty service in mines, general excavation, trench and road work where the drill must be lifted frequently or carried some distance between holes. Use the J-40 and JL-3 Jackleg for horizontal work.
	J-30	35 Pounds	19⅛ Inches	The J-30 is a rugged lightweight. It is ideally suited for all drilling where the Jackhamer must be held for horizontal or semi-horizontal work. This includes off-plank drilling in coal mines, plugging, trimming and cutting hitches. It also has many applications in industrial plants such as drilling foundation bolt holes, holes for conduit, etc.
	J-10	14 Pounds	17⅛ Inches	The 14-pound J-10 is best described as a Utility Jackhamer. Although complete with automatic rotation and hole blowing, it is not limited to drilling only. It can be used with chisels, gouges, moil points, star drills from ⅝" up and Jackbits up to 1¾" gauge. The J-10 handles easily from a scaffold or ladder. Its applications are limited only by the ingenuity of the user.

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CARSET JACKBIT

For the complete story on I. R. Jackhamers, write for Catalog 4096.

Ingersoll-Rand

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Photo courtesy Inland Empire Paper Co.

Rubber helps put the squeeze on paper

A typical example of B. F. Goodrich product improvement

GOING down that line is next month's newspaper: those big rolls are squeezing the last water out of pulp—off the last roll will come dry, finished paper.

But the leather belt that had been used to drive those heavy rolls had to be so tight that it soon stretched and wore out. Then the whole mill would shut down while the belt was repaired or replaced. An ordinary rubber belt wouldn't do because the pull on the belt was so great the metal fasteners, used for joining the belt ends, would tear out.

But B. F. Goodrich had developed a belt so strong it rarely stretches and then invented a method of locking belt ends together with a splice which never tears loose. Where ends of the outside plies come together they are carried down under the surface, protected by a flexible top layer and vulcanized with new rubber. This splice actually ends 90% of all belt troubles.

A B. F. Goodrich rubber belt, made endless by this Plylock Splice, as it is called, was put on the big mill in the picture; it has already outlasted leather 3 to 1.

The Plylock Splice illustrates the B. F. Goodrich policy of constantly improving the value to the customer of everything made of rubber-for-industry. Research here never stops; nothing is ever "good enough"; improvement must be constant. Some people might call it improving ourselves out of business; we call it the American competitive profit system at work. *The B. F. Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

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ENGINEERING AND MINING JOURNAL

84th YEAR OF PUBLICATION

VOLUME 151 — **FEBRUARY 1950** — NUMBER 2

E&MJ Outlook 67

Market Summary 68

Behind the By-Lines 70

Editorial 71

Steady Demand Ahead as Mining Enters 1950 72

Metals in Review 76

Gold . . . . . M. A. KRIZ 76

Silver . . . . . D. H. LEAVENS 80

Copper . . . . H. H. WANDERS 82

Lead . . . . . R. L. ZIEGFELD 84

E&MJ Average Prices 86

Zinc . . . . . C. R. INCE 87

Tin . . . . . H. H. WANDERS 89

Light Metals . . . . R. J. LUND 90

Minor Metals . . . C. W. MERRILL 93

Ferro-Alloy Metals . C. W. MERRILL 97

Phosphate . . . . . J. A. BARR 103

Potash . . . . . JACK PIERCE 100

Feldspar . . . . . S. T. HENRY 105

Perlite . . . . . S. W. JOHNSON 102

Barite . . . . . W. B. HESTER 101

Modern Exploration Methods . . . . . HANS LUNDBERG AND BASIL WILSON 106

Drilling Still Holds the Attention of Mine Operators . . . . . A. H. HUBBELL 108

Iron Ore Beneficiation Leads Advance in Milling 116

1949 Has a Year of Progress in Non-Ferrous Metallurgy . . . A. W. SCHLECHTEN 120

Washington Reflections 126

New Products Digest 139

Personal News 130

Operating Ideas 148

This Month in Mining 150

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2	25
3	50
4	75
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7	150
8	175
9	200
10	250
11	300
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16	550

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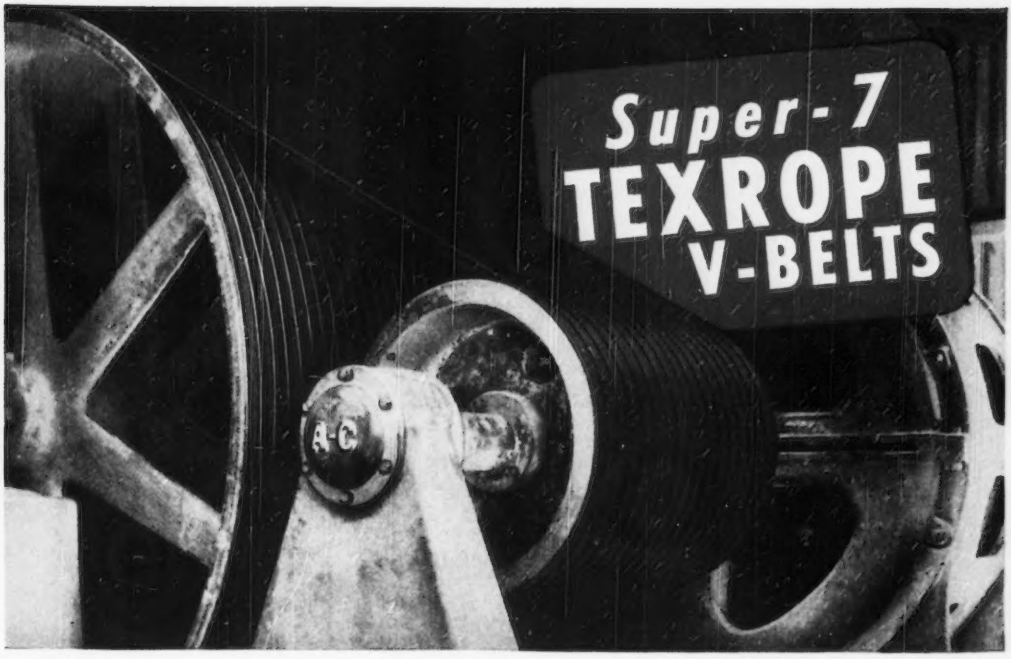

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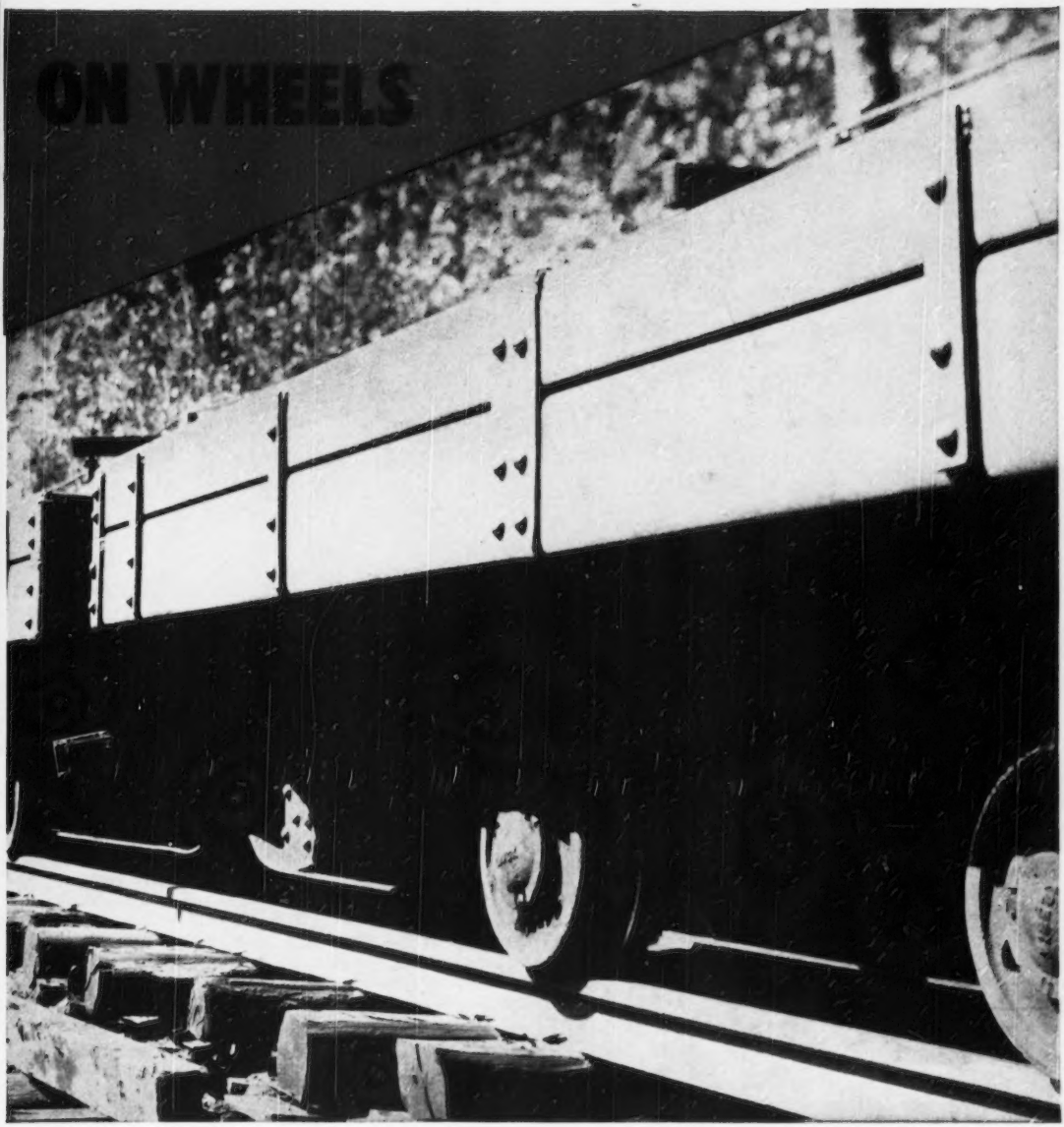

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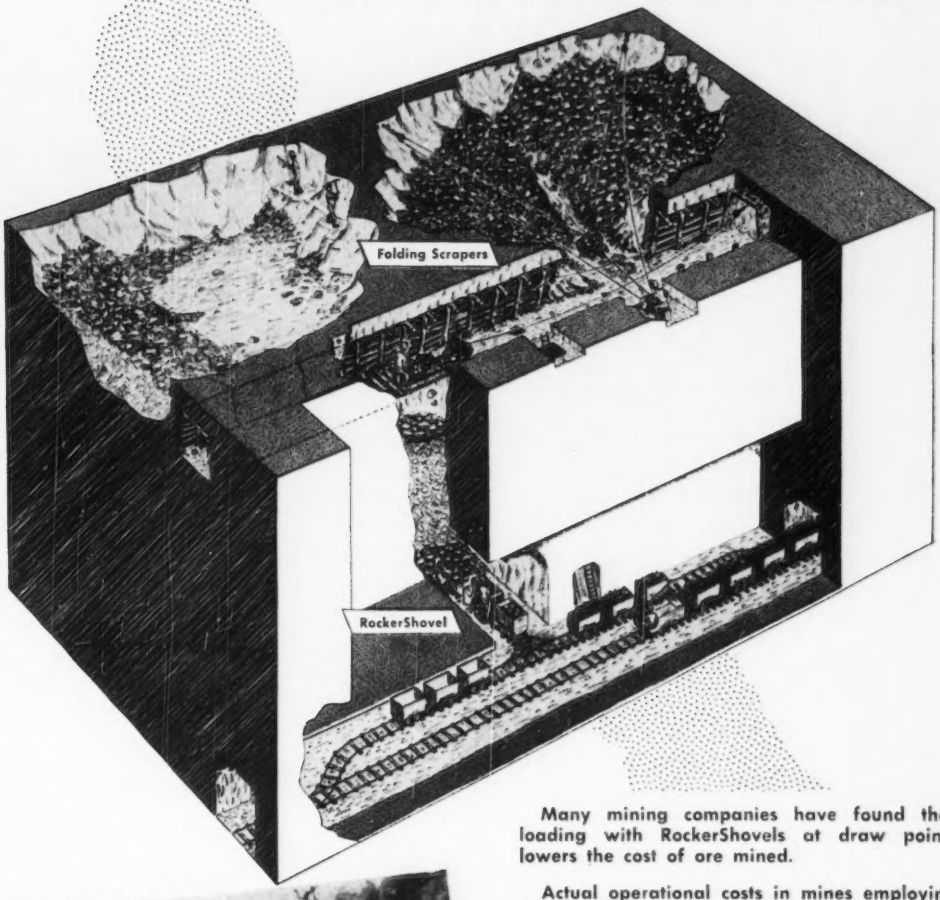

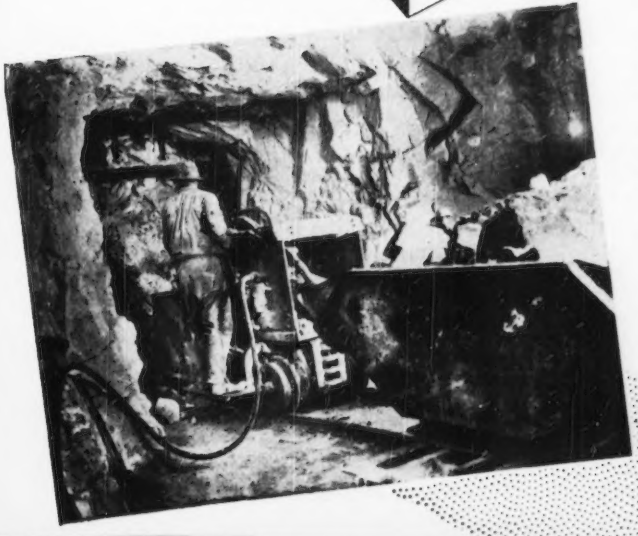

Many mining companies have found that loading with RockerShovels at draw points lowers the cost of ore mined.

Actual operational costs in mines employing both chutes and grizzles and RockerShovels show between $.08 and $.10 per ton loaded, in favor of the RockerShovels.

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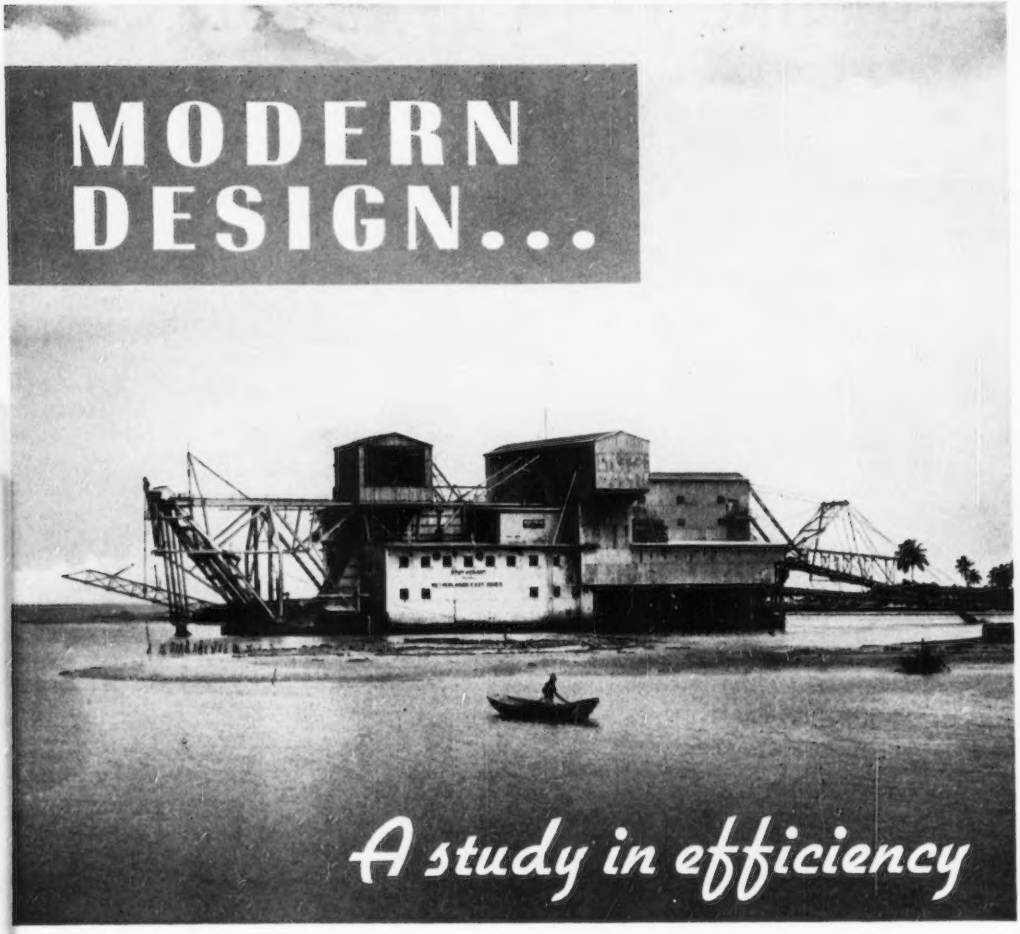

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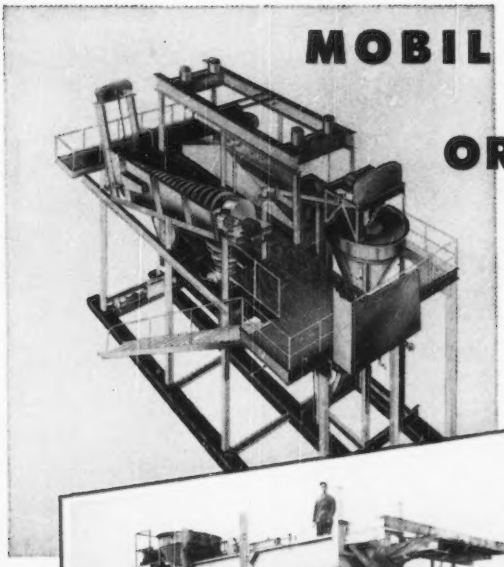

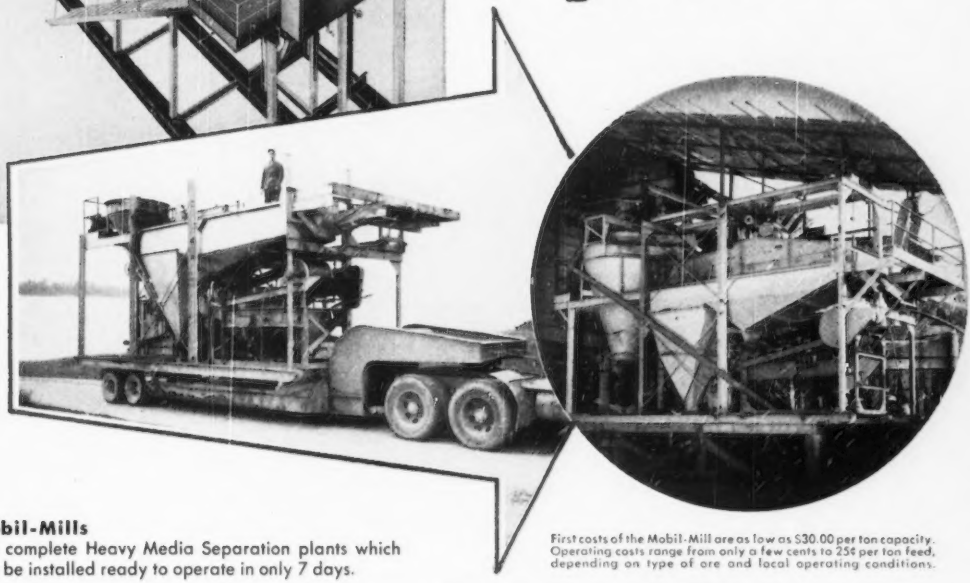

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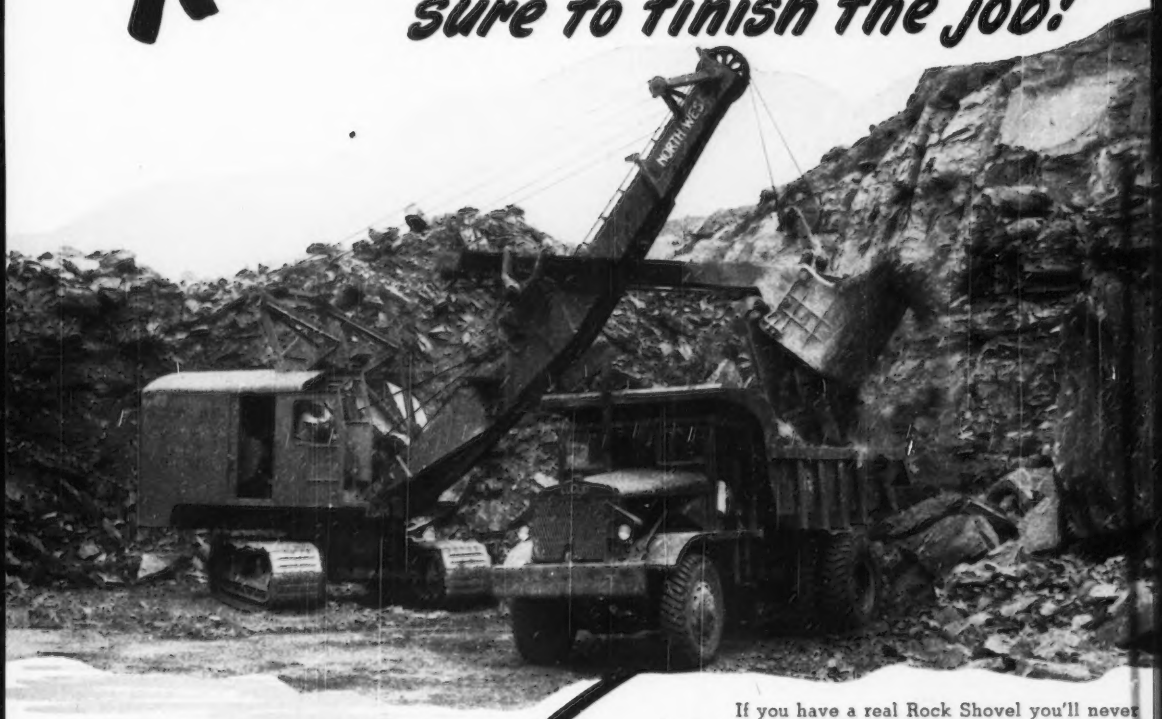

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Northwests are proved Rock Shovels with advantages a Rock Shovel should have.

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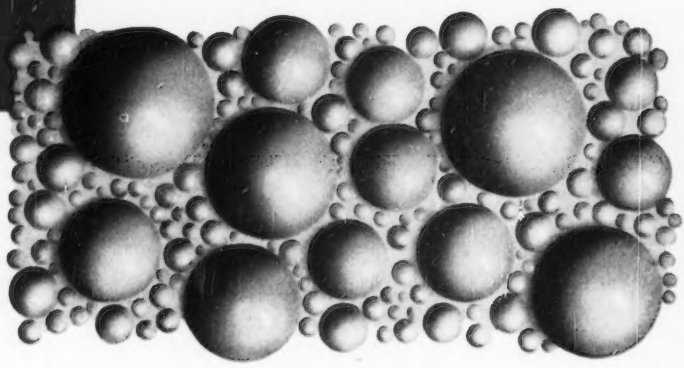
Dependable Bear Brand Xanthates

"Over Twenty-Five Years' Experience in Producing Xanthates for Metallurgical Use."



BEAR BRAND XANTHATES AVAILABLE

- **Z-3—Potassium Ethyl Xanthate**
- **Z-4—Sodium Ethyl Xanthate**
- **Z-5—Potassium Amyl Xanthate***
- **Z-6—Potassium Pentasol Amyl Xanthate***
- **Z-8—Potassium Sec.-Butyl Xanthate**
- **Z-9—Potassium Isopropyl Xanthate**

*From Sharples Amyl Alcohols

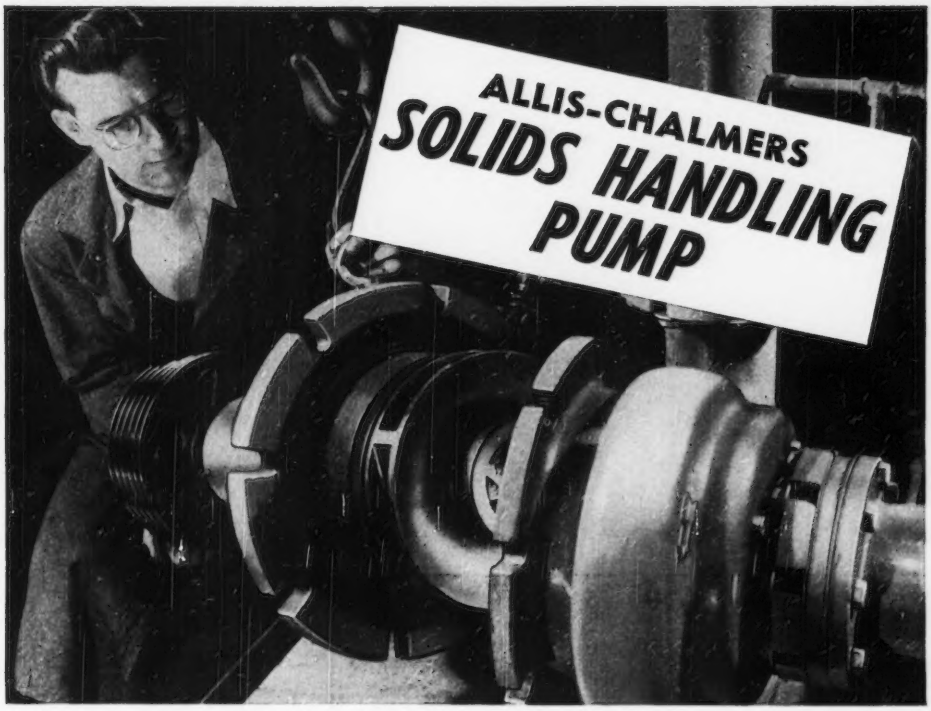
Time and experience have demonstrated that for optimum results in the flotation treatment of substantially all sulphide ores, as well as some oxidized ores and ores containing native metals, Bear Brand Xanthates are the cheapest and most efficient collectors now available.

Great Western Division
THE DOW CHEMICAL COMPANY
San Francisco 4, Calif., U.S.A.

GREAT WESTERN DIVISION • BEAR BRAND PRODUCTS • THE DOW CHEMICAL COMPANY

DOW CHEMICALS

Only ½ Hour to Service!



ALL SOLIDS HANDLING PUMPS require periodic replacement of worn parts. This Allis-Chalmers "CW" pump saves you money because parts replacement is easy, fast and economical. The entire pump can be dismantled and reassembled in a half hour without disturbing piping.

Parts with varying rates of wear are separated. Only worn parts need be replaced. Three sets of bearings, brackets and shafts cover entire range of pump sizes . . . reducing parts inventories as much as 2/3!

USERS REPORT LONG WEAR

Experiences of operators prove that the combination of *Allisite*, an abrasion-resistant alloy, *heavier construction* and expert *application engineering* give the "CW" pump longer wear between servicings. Users say:

"Spent $300 a month for maintenance on previous pump. A-C solids handling pump has required only routine lubrication in nine months."

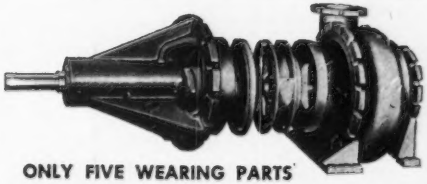
"A-C solids handling pump gives 350 hours service compared with 80 hours on best previous pump."

"Part needing most frequent replacement has approximately ten times the life of same part on previous pump at approximately same initial cost."

An A-C representative will be glad to give you additional facts and figures on possible savings for you. Or write for Bulletin 6381. A-2766

ALLIS-CHALMERS, 969A SO. 70 ST.
MILWAUKEE, WIS.

Allisite is an Allis-Chalmers trademark.



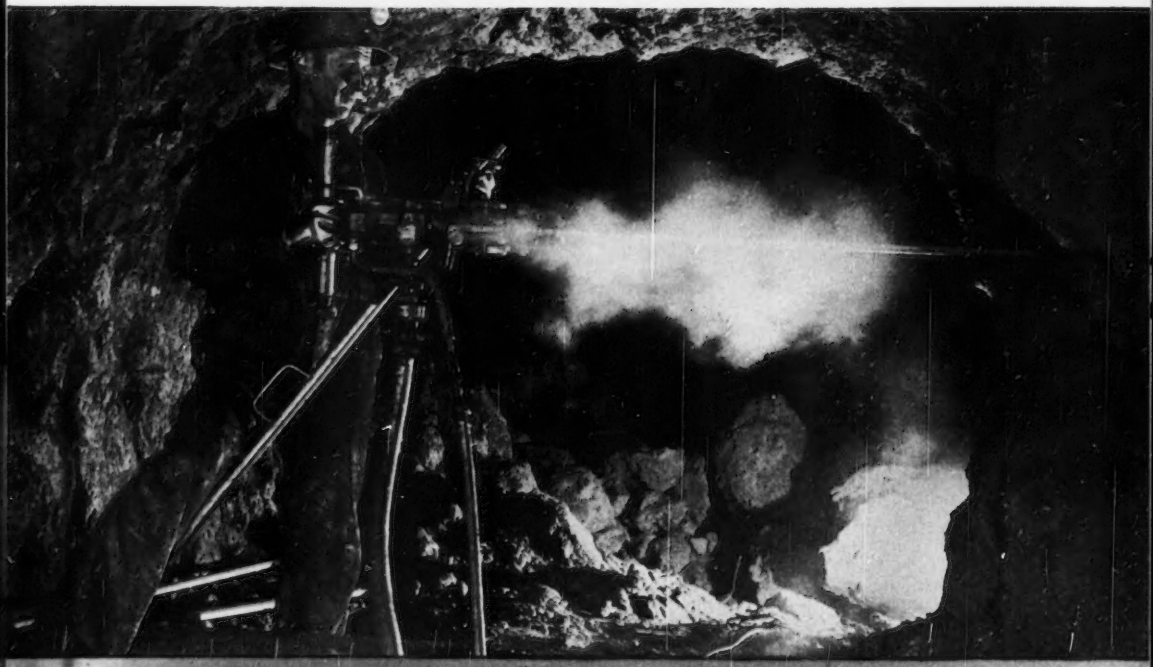
ONLY FIVE WEARING PARTS

Shaft sleeve, impeller, casing, two wear plates. All easy to handle and easy to replace.

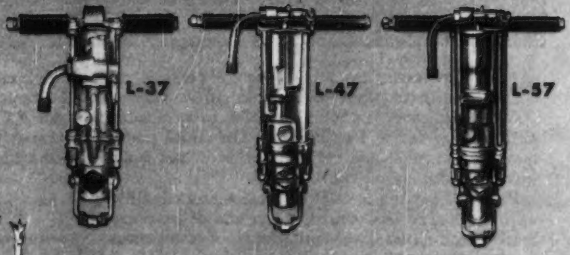
A-C ALLIS-CHALMERS

ALLIS-CHALMERS

For Down-holes—Bench work—



Above, a 35-lb. JOY L-37 on a homemade supporting leg. *Below*, an L-57, the JOY heavyweight, drilling down-holes on a bench.



Standardize on

JOY ROCK DRILLS

and

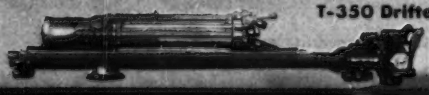
SULMET BITS

for lowest cost per foot of hole

SULMET Tungsten Carbide Bit

SS-10 Safety Stoper

T-350 Drifter



Small working areas—

JOY

SILVER STREAK

HAND-HELD DRILLS

Handle EASIER!
Drill FASTER!
Last LONGER!

- ★ **There's a size and weight for every need!**
- ★ **They're the only drills CADMIUM PLATED inside and out for greater efficiency—longer service life!**
- ★ **They're the only drills with the famous DUAL-VALVE that makes air do more work!**

Be sure to see the JOY Film **"HARD ROCK MECHANIZED MINING"** . . . in natural color, with sound. Write JOY'S Film Booking Department to reserve a print for showing to your group.

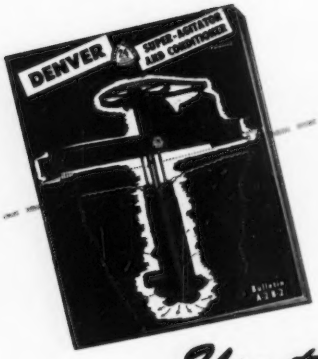
Write for Bulletin or *Consult a Joy Engineer*

BD M 2942

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

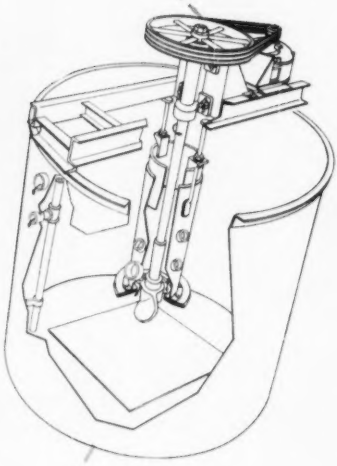


For Better

- AGITATING
- CONDITIONING
- AERATING
- MIXING

Use the DENVER

SUPER-AGITATOR AND CONDITIONER*



High Specific Gravity Pulps Efficiently Handled

Designed in a complete range of capacities for use in metallurgical, chemical and process industries, the Denver Super-Agitator and Conditioner will agitate, condition, aerate or mix any combination of liquids, or liquids and solids, which will flow through a 10-mesh screen. The machine is particularly suited to difficult problems involving pulps of high density or those containing high specific gravity solids. For use in acid circuits, corrosion resistant materials are available.

***PATENTED FEATURES GIVE EFFICIENT OPERATION AT LOWER COST**

Positive Feed Eliminates Short Circuiting

All feed enters the patented standpipe where it is drawn directly down into the propeller zone. Recirculation is through selectively adjustable openings on sides and top of standpipe. This positive and controllable flow eliminates all possibility of pulp short circuiting.

Adjustable Weir Gives Controlled Aeration

Addition of air into the pulp is controlled by the adjustable weir collar. Thus the adjustable depth of the swirling vortex of pulp draws the desired quantity of air through the propeller zone and into the material. Supercharging or the use of gas can also be easily adapted to this standard Denver Machine.

Wearing Plate Reduces Propeller Load and H.P.

The patented wearing plate at the standpipe bottom prevents overcrowding the propeller, thus reducing horsepower required. The same hood wearing plate prevents sanding in of propeller so that the machine can be quickly put back into service after shutdown.

Write for 16-page bulletin A2-B2 which describes in detail these and other operating advantages of the Denver (Patented) Super-Agitator and Conditioner and other agitating mechanisms. We can make good delivery on these standard Denver machines.

DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

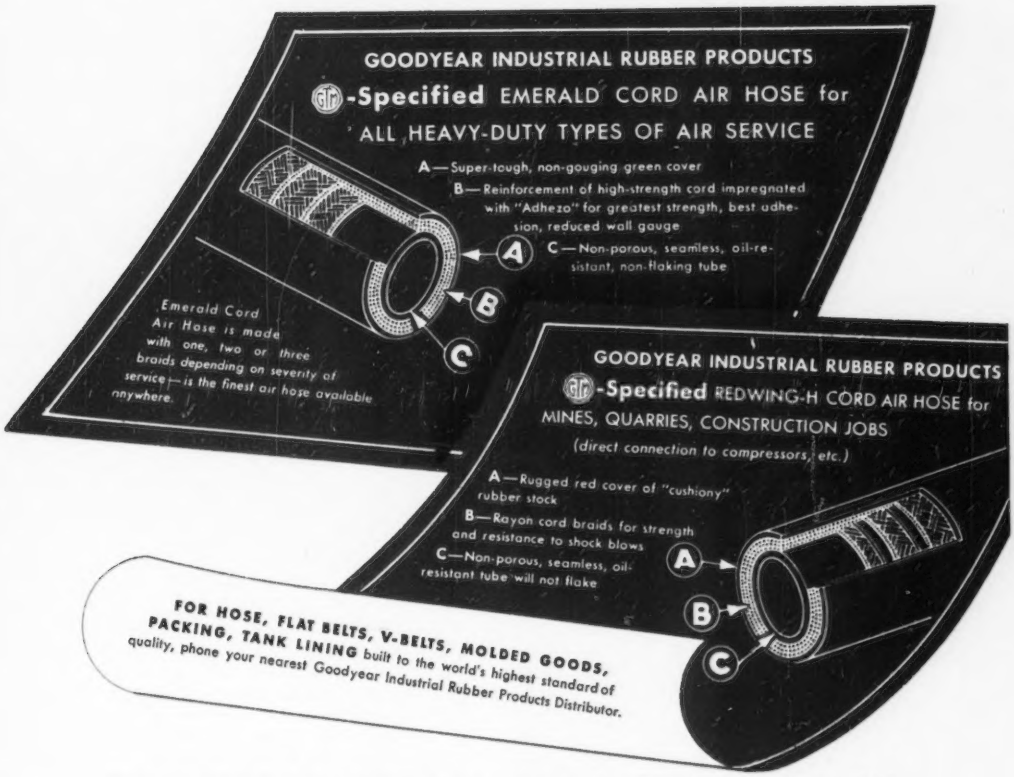
FLOTATION ENGINEERS

"The firm that makes its friends happier, healthier and wealthier"

DENVER • NEW YORK • CHICAGO • EL PASO • VANCOUVER • TORONTO • MEXICO, D.F. • LONDON • JOHANNESBURG • RICHMOND

DENVER EQUIPMENT COMPANY, 1402 17th St., Denver 17, Colorado

2 ways to Better Air Service


GOODYEAR INDUSTRIAL RUBBER PRODUCTS
-Specified EMERALD CORD AIR HOSE for
ALL HEAVY-DUTY TYPES OF AIR SERVICE
A—Super-tough, non-gouging green cover
B—Reinforcement of high-strength cord impregnated with "Adhezo" for greatest strength, best adhesion, reduced wall gauge
C—Non-porous, seamless, oil-resistant, non-flaking tube
A
B
C
Emerald Cord Air Hose is made with one, two or three braids depending on severity of service—is the finest air hose available anywhere.
GOODYEAR INDUSTRIAL RUBBER PRODUCTS
-Specified REDWING-H CORD AIR HOSE for
MINES, QUARRIES, CONSTRUCTION JOBS
(direct connection to compressors, etc.)
A—Rugged red cover of "cushiony" rubber stock
B—Rayon cord braids for strength and resistance to shock blows
C—Non-porous, seamless, oil-resistant tube will not flake
A
B
C
FOR HOSE, FLAT BELTS, V-BELTS, MOLDED GOODS, PACKING, TANK LINING built to the world's highest standard of quality, phone your nearest Goodyear Industrial Rubber Products Distributor.

For the best service at the lowest cost in the long run, ask the G.T.M.—Goodyear Technical Man—for either of these pace-setting hoses. Emerald Cord is the finest air hose made—Redwing-H Cord gives high quality at a lower price. To consult the G.T.M., phone your nearest Goodyear Distributor, or write Goodyear, Akron 16, Ohio.

Emerald Cord, Redwing—T.M.'s The Goodyear Tire & Rubber Company

GOODYEAR

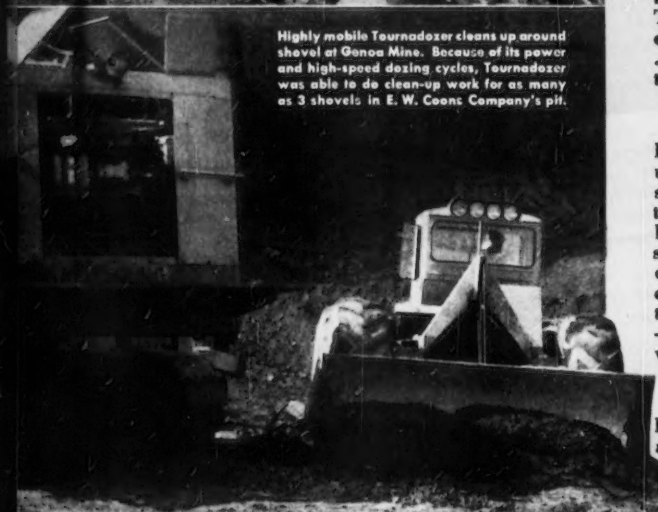
THE GREATEST NAME IN RUBBER

We think you'll like "THE GREATEST STORY EVER TOLD"—Every Sunday—ABC Network

TOURNADOZER

Cleans up for 3 Shovels

Dozes overburden — Tournadozer's stability, multiple-disc air brakes, instant controls, and sure four-wheel traction enable it to work safely at edge of dump. Dozing cycle is completed in ⅓ of the time it takes slow-moving crawler.



Highly mobile Tournadozer cleans up around shovel at Genoa Mine. Because of its power and high-speed dozing cycles, Tournadozer was able to do clean-up work for as many as 3 shovels in E. W. Coons Company's pit.

At Eveleth, Minnesota, the E. W. Coons Company really put their rubber-tired Super C Tournadozer through its paces at their Genoa strip mine. Used primarily to maintain two overburden dumps and a lean ore stockpile, Tournadozer's high speed and extreme mobility enable it to handle all 3 dumps with time to spare . . . produce dollars while other units are in transit to the job.

Does 7 Jobs in 10 Hours

For example, the E. W. Coons Co. frequently call upon their high-speed Tournadozer to clean up spillage around their large stripping shovels . . . then hustle off and maintain to-and-from-dump haul roads. On a recent night shift their "fast-stepping" Tournadozer maintained both overburden dumps . . . the lean ore stockpile . . . did clean-up work around three stripping shovels . . . then sped out to do haul road maintenance work — all in one 10-hour shift of operation! No wonder E. W. Coons Co. like their Tournadozer.

Goes Anywhere—Fast

Like Coons, you will find that Tournadozer travels anywhere around the mine . . . negotiates steep

LET

See your Le Tourneau Distributor NOW for complete information

. . . at Minnesota Iron Mine . . . Maintains 3 Dumps

Instantaneous shift plus high speeds forward and reverse enable Tournadozer to move more dirt per hour. Fast rubber-tired speed and 100% mobility let it run anywhere, anytime . . . a mile across pit is only a few minutes away.

grades . . . can travel on pavement or cross-country. Giant rubber tires carry it across rails or along right-of-way. No matter where you want to go for dozing, clearing, hauling or pushing service there is no need for planking, no waiting for trailer or flatcar.

Plenty of Power and Traction

Four-wheel drive powered by 180 h.p. diesel engine gives you plenty of power and traction behind rugged 2½-yard blade for dozing under all conditions. Constant-mesh transmission with instantaneous speed selection means you have constant power without stopping to shift gears. Electric control means you get faster, easier operation . . . increased operator efficiency.

Ideal for All Dozing Jobs

Tournadozer meets the multiple demands of the E. W. Coons Company and will fill your need for a faster, more maneuverable dozer, too.

For complete facts on rubber-tired Tournadozer, contact your LeTourneau Distributor TODAY!

Tournadozer-Trademark Reg. U. S. Pat. Off.

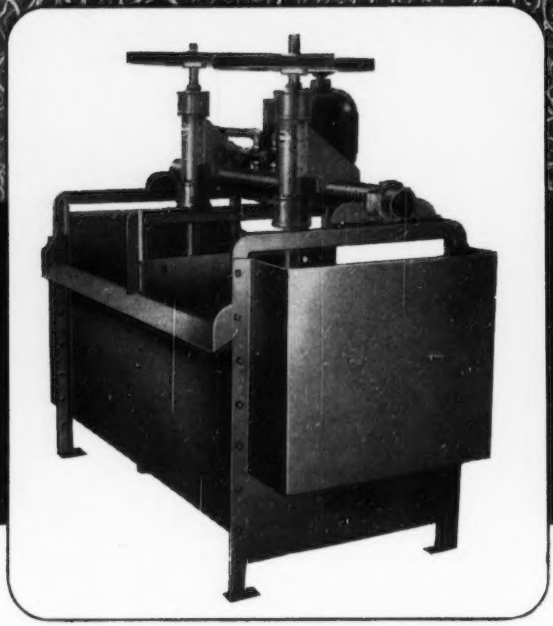
LETOURNEAU PEORIA, ILLINOIS — JOB-PROVED Over 6,415 Built and Shipped — **TOURNADOZERS**

IT'S RUBBER THAT PUTS THE ACTION IN TRACTION

....take off a more PROFITABLE FROTH

with

AGITAIR FLOTATION MACHINE



Profit By More Efficient Recovery

Recovery of valuable mineral is assured by the thorough diffusion of air into the pulp—air that is induced by blower can be controlled at all times to meet fluctuations in the flotation circuit. Agitair's air control feature provides the quantity of froth required for rapid, efficient mineral separation and results in reduced tailing losses and increased tonnage handled per hour.

Profit By Cutting Power Consumption

The Agitair Flotation Machine expends only about 80% of its installed horsepower when in operation. The surplus power is used for starting under load. This operating power is used only for circulating and aerating the pulp. The pulp flows by gravity and is not pumped within the machine. On the basis of KW hours per ton of ore treated, consumption is usually less than that of other flotation machines.

Write for detailed information on how Agitair's economical and efficient operation can be applied to your specific problem.

"Leaders in Experience and Service"

THE GALIGHER COMPANY

METALLURGICAL DIVISION · ENGINEERING SERVICE

CONSULTATION • ORE TESTING • PLANT DESIGN • CONSTRUCTION

AGENTS IN ALL PRINCIPAL FOREIGN MINING DISTRICTS

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SALT LAKE CITY, UTAH
P. O. BOX 209

EASTERN OFFICE
921 BERGEN AVENUE
JERSEY CITY,
NEW JERSEY

NOW for the first time...

...A HIGH-VOLTAGE INSULATION WITH ALL THE PROPERTIES NECESSARY FOR TROUBLE-FREE SERVICE UNDER ALL OPERATING CONDITIONS...

LOW WATER ABSORPTION

OZONE RESISTANCE

RESISTANCE TO HEAT and AGING

SIMPLEX-ANHYDREX XX

Here at last, in the new Anhydrex XX insulation, is the combination that assures dependable, low-cost cable performance under all conditions of high-voltage service. And in Anhydrex XX none of the effectiveness of one property has been sacrificed to gain the others.

Aged in an air oven for sixteen weeks at the grueling temperature of 250 F. (121 C.) Anhydrex XX remained rubber-like in quality and appearance, was still suitable for continued use. It retained approximately half of its tensile strength, nearly two-thirds its elongation. Most important of all, its rate of deterioration after the first few weeks was very slight, indicating exceptional stability and long life.

Ordinary oil base and heat-resistant compounds could not match this performance. Inside of only three weeks both had become brittle and, upon bending, immediately cracked and crumbled.

Aged at the same high temperature for seven days, Anhydrex XX was immersed for a week in distilled water at 158 F. (70 C.). It would not absorb more than 15 mg. per square inch of exposed surface. Bent around a mandrel, it was exposed to .03% ozone for four hours yet would not crack.

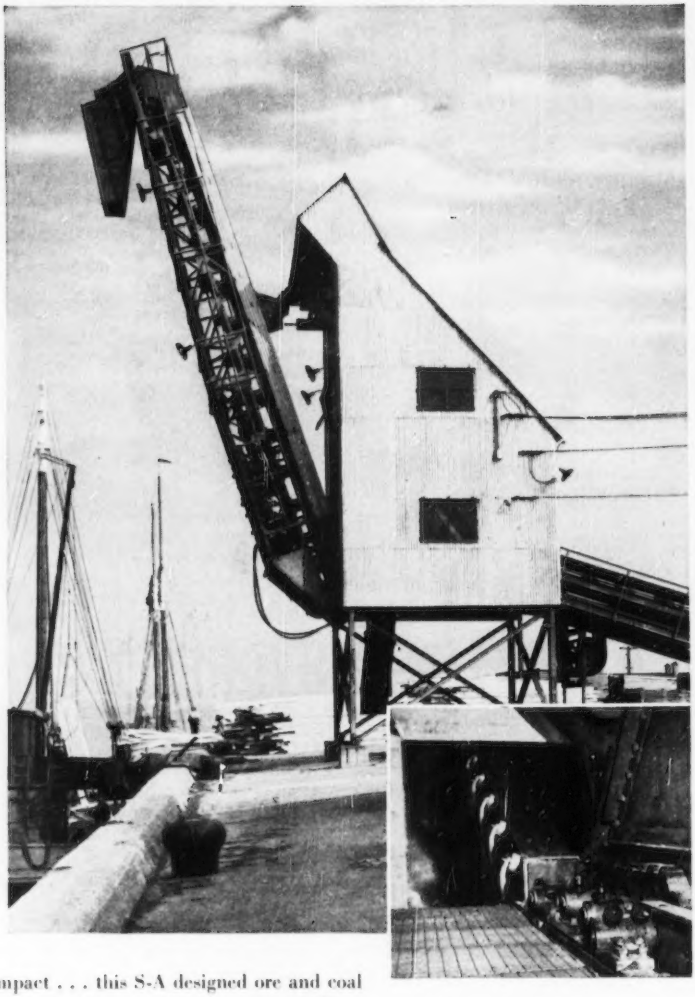
Anhydrex XX is the only insulation that provides this valuable combination. So that you may determine fully the effectiveness and stability of these properties even after years of service, we have drawn up an ironclad specification for Anhydrex XX which we will gladly send you upon request. Simply fill in and mail the coupon below.

SIMPLEX WIRES & CABLES

SIMPLEX WIRE & CABLE CO.
79 Sidney St., Cambridge 39, Mass.

SIMPLEX WIRE & CABLE CO.
79 SIDNEY ST., CAMBRIDGE 39, MASS.
GENTLEMEN: PLEASE SEND A COPY OF SPECIFICATION 1685 TO:
NAME _____ TITLE _____
COMPANY _____
STREET _____
CITY _____ STATE _____

LOWERS THE BOOM on Handling Costs



Simple, fast, economical, compact . . . this S-A designed ore and coal handling system moves big tonnage at low cost. With no manual effort, this boom conveyor and supplemental equipment can quickly load lake steamers at minimum handling cost.

Supplying cost-reducing systems for moving all kinds of bulk materials has long been the job of S-A engineers. From the S-A line that includes every type of conveyor, S-A engineers can select the one right combination to provide the most modern system to do a particular job . . . and at lowest cost per ton.

Take advantage of the years of experience of these men. Just ask for their recommendations either for a new installation or an improvement of your present method. There's no obligation so . . . write today.

From two rail cars at once, ore and coal can be dumped into double track hopper. S-A rack and pinion gates regulate flow of material to two short feeders in tunnel under hoppers. Pan feeders move material to an inclined belt conveyor which takes it up to a dockside housing. Hinged boom conveyor conveys material out over dock for discharge directly into ship holds. Hoist permits raising and lowering boom conveyor.

STEPHEN S-A ADAMSON MFG. CO.

4 Ridgeway Avenue, Aurora, Illinois — Los Angeles, Calif. • Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

Here's Why So Many Ore Miners Prefer Du Pont "MS" Delay Caps

Easier to handle—a big help on most jobs. All 14 clearly-marked "MS" Delay periods (25 to 500 milliseconds) have short length cap shells that facilitate priming.

• • •

Greater Safety—Du Pont "MS" Caps substantially reduce vibration and concussion . . . which means less timber damage and repair work. They pull the rounds clean . . . leave no dynamite in the muck.

• • •

Improved fragmentation—even from badly fractured veins. With "MS" Caps, you can often reduce the explosive load, and so lower the cost per ton of ore mined.

Other features of "MS" Delay Electric Caps include these three important points: (1) clean, brightly colored nylon insulated wires. (2) double-crimped, water-resistant rubber plug closures. (3) protective Cellophane-lined aluminum foil shielded shunts that reduce the risk of premature firing due to stray currents.

• • •

You can get complete information about "MS" (millisecond) Delay Electric Blasting Caps, and other widely used Du Pont ore mining products from the Du Pont Explosives representative serving your vicinity. See him soon—he's a good man to know. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

. . . and for open pit operations

DU PONT "NITRAMON"* AND "NITRAMEX"**

"Nitramon" is the safest blasting agent made. It is detonated with a "Nitramon" Primer, itself relatively insensitive. Packed in water-tight containers, it is ideal for open-pit work . . . holes can be loaded far in advance of firing time. Non-headache-producing, too.

"Nitramex"—companion product to "Nitramon"— is a stronger blasting agent designed for toe shooting where excessively hard rock is encountered. Ask your Du Pont Explosives representative about these two popular Ore Mining products.

*"Nitramon" is a registered trade-mark for nitrocarbonitrate blasting agent.

**"Nitramex" is a trade-mark for Du Pont ammonium nitrate blasting agent.

DU PONT "DETECT-A-METER"

. . . a stray current detector that's also a blasting galvanometer. Does both jobs and aids in promoting safety in ore mines and on stripping operations. Make a note to get complete information about it.

DU PONT BLASTERS' HANDBOOK

. . . just revised with over 470 pages of facts for every blaster. A ready reference you really can't afford to be without.

Listen to "Cavalcade of America"
—Tuesday Evenings—NBC

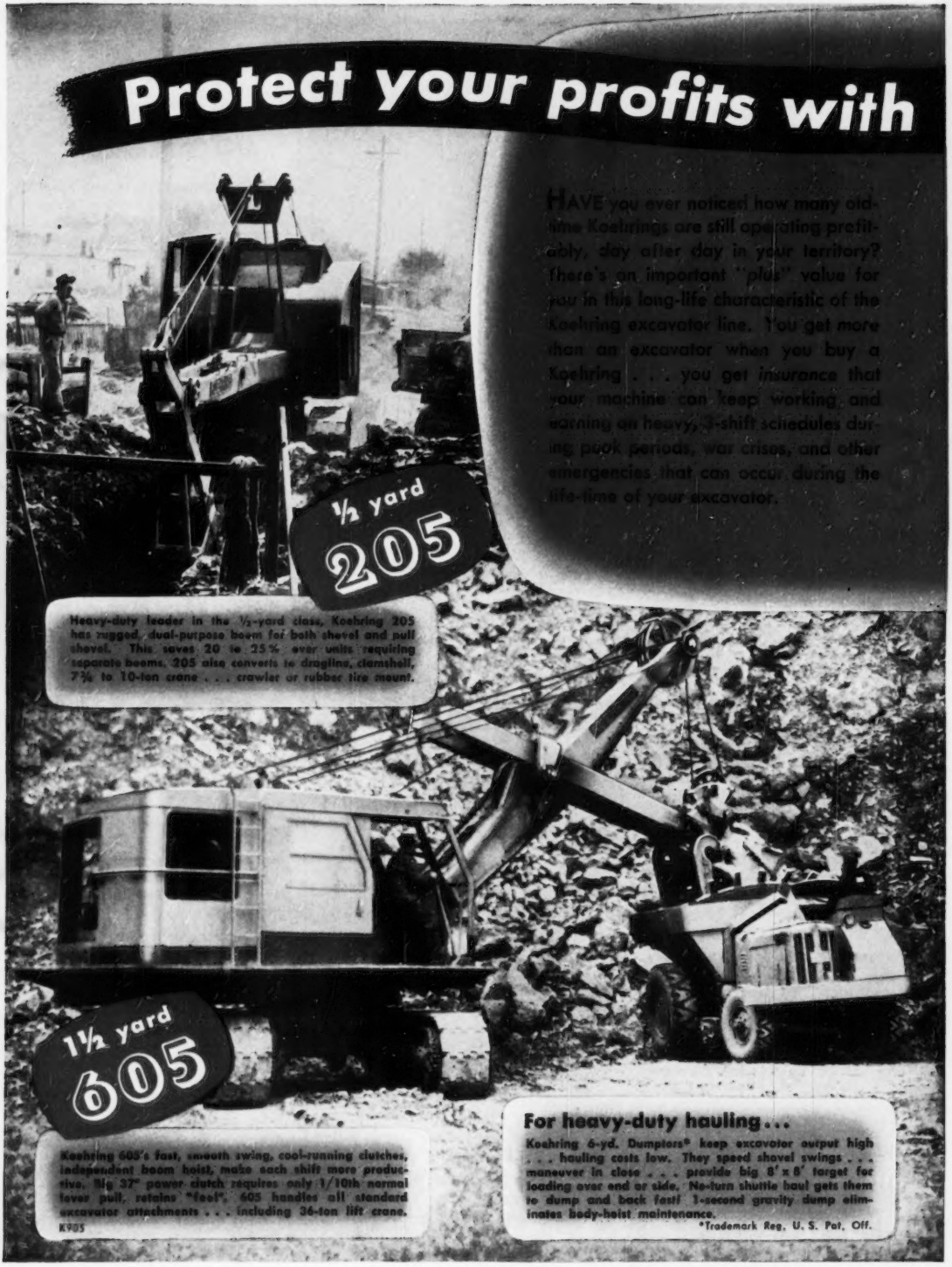
DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

DU PONT EXPLOSIVES

BLASTING SUPPLIES AND ACCESSORIES

Protect your profits with



HAVE you ever noticed how many old-time Koehrings are still operating profitably, day after day in your territory? There's an important "plus" value for you in this long-life characteristic of the Koehring excavator line. You get *more* than an excavator when you buy a Koehring . . . you get *insurance* that your machine can keep working and earning on heavy, 3-shift schedules during peak periods, war crises, and other emergencies that can occur during the life-time of your excavator.

½ yard 205

Heavy-duty leader in the ½-yard class, Koehring 205 has rugged, dual-purpose boom for both shovel and pull shovel. This saves 20 to 25% over units requiring separate booms. 205 also converts to dragline, clamshell, 7¾ to 10-ton crane . . . crawler or rubber tire mount.

1½ yard 605

Koehring 605's fast, smooth swing, cool-running clutches, independent boom hoist, make each shift more productive. Big 37" power clutch requires only 1/10th normal lever pull, retains "feel". 605 handles all standard excavator attachments . . . including 36-ton lift crane.

K-905

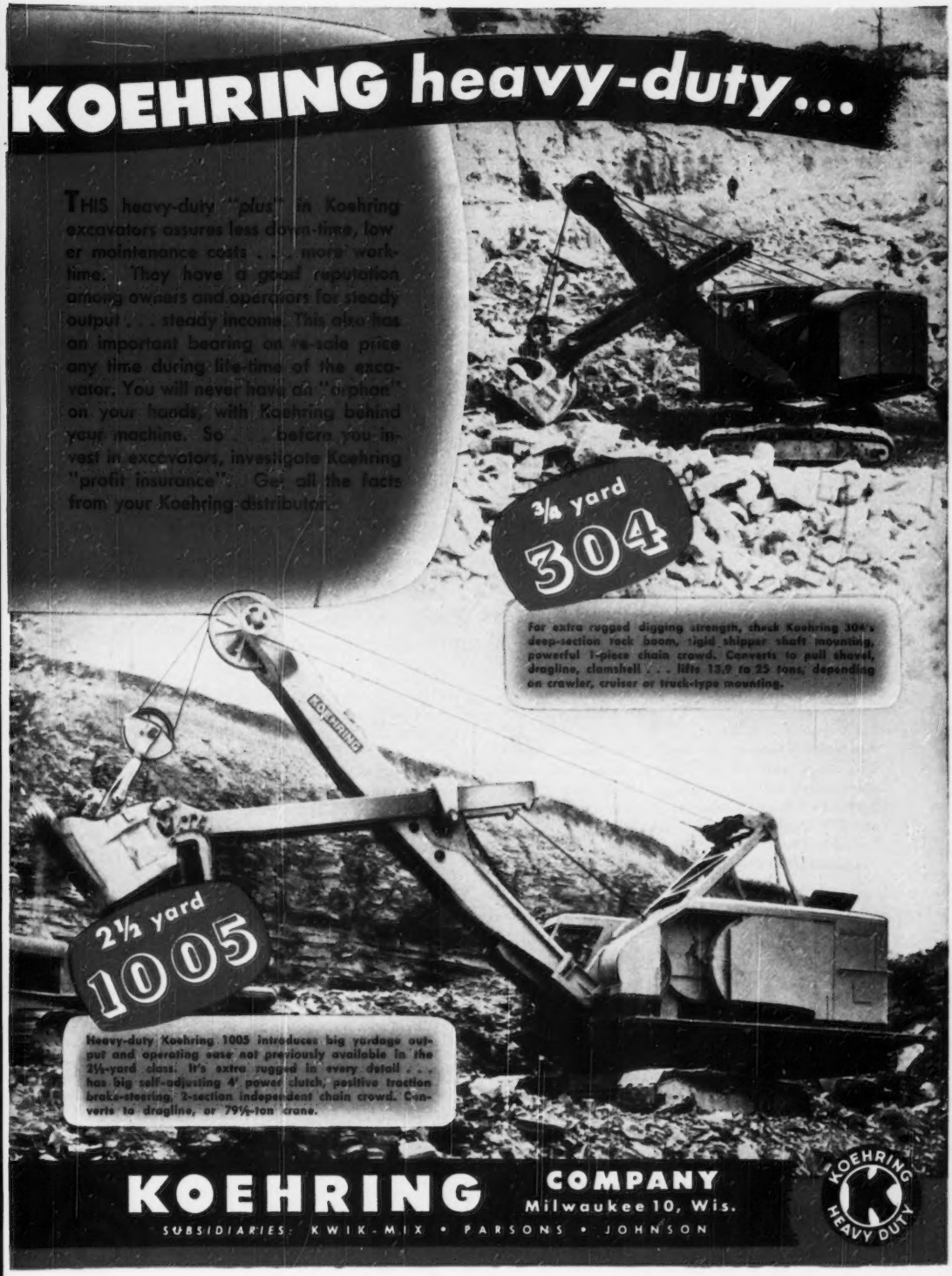
For heavy-duty hauling . . .

Koehring 6-yd. Dumpters® keep excavator output high . . . hauling costs low. They speed shovel swings . . . maneuver in close . . . provide big 8' x 8' target for loading over end or side. No-turn shuttle haul gets them to dump and back *fast!* 1-second gravity dump eliminates body-hoist maintenance.

®Trademark Reg. U. S. Pat. Off.

KOEHRING heavy-duty...

THIS heavy-duty "plus" in Koehring excavators assures less down-time, lower maintenance costs . . . more work-time. They have a good reputation among owners and operators for steady output . . . steady income. This also has an important bearing on re-sale price any time during life-time of the excavator. You will never have an "orphan" on your hands, with Koehring behind your machine. So . . . before you invest in excavators, investigate Koehring "profit insurance". Get all the facts from your Koehring distributor.


3/8 yard
304
For extra rugged digging strength, check Koehring 304's deep-section rock boom, rigid shipper shaft mounting, powerful T-piece chain crowd. Converts to pull shovel, dragline, clamshell . . . lifts 13.9 to 25 tons, depending on crawler, cruiser or truck-type mounting.
KOEHRING
2½ yard
1005
Heavy-duty Koehring 1005 introduces big yardage output and operating ease not previously available in the 2½-yard class. It's extra rugged in every detail . . . has big self-adjusting 4' power clutch, positive traction brake-steering, 2-section independent chain crowd. Converts to dragline, or 79½-ton crane.

KOEHRING COMPANY
Milwaukee 10, Wis.
SUBSIDIARIES: KWIK-MIX • PARSONS • JOHNSON

KOEHRING HEAVY DUTY

Look for the name AMSCO®* on the dipper you specify...

Amsco Engineering — plus Amsco Manganese Steel Construction — means more efficient, more profitable shovel operation.

Profit is determined by *handling costs per yard,* and here are 2 important reasons why you can lower those handling costs with AMSCO Dippers:

Austenitic Manganese Steel—For Longer Life— The more you use an Amsco dipper, made of manganese steel throughout, the harder it gets! Surfaces that are subject to impact and abrasion actually work-harden and take on a high polish for added wear-resistance.

Manganese Steel—"the toughest steel known"—withstands the most severe breaking stresses.

AMSCO Engineering—For Better Operation— Years of Amsco design experience bring you a *complete line,* from which you can select dippers "custom-engineered" to your own requirements . . . for deep penetration, full loading and positive dumping. Whether you need manganese steel Welded, Missabe, Renewable Lip types, or special designs for unusual service, *you'll get longer wearing life and greater economy when you specify Amsco.*

NOW! Prompt delivery of Amsco Dippers and Parts

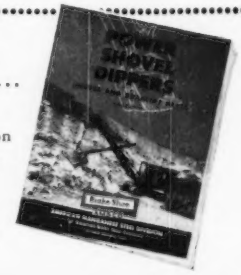
AMSCO®
WELDING PRODUCTS

The fast, low-cost way to get worn or damaged equipment back in service.

Amsco hardfacing rods make important on-the-job savings . . . keep down time at a minimum. Contact your supply house or Amsco representative for information on the complete Amsco line of Welding Rod, Weldments and Repointer Bars.

Get the facts on the complete Amsco Line...

This 40-Page booklet is packed with information on Amsco Dippers, and parts for shovels and draglines. Write today for your free copy . . . ask for Bulletin No. 547 DS.

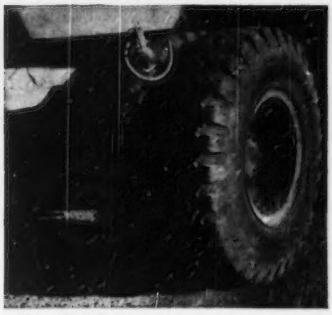


AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
376 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

B.F. Goodrich

Universal all-nylon for jobs where traction is problem. Note 2-way tread, bulky wedge-shaped cleats.



These *Rock Logger all-nylons* were on a truck in extremely tough service for 2 years . . . are still going strong!

ALL-NYLON

tires give full service with no bruise or flex failures

THE B. F. Goodrich ALL-NYLON tire is now in use—and proving successful—in mining operations throughout the country. The record speaks for itself: *no blowouts, no bruise breaks, no flex breaks* . . . and that includes severe operating conditions in mines where flex and bruise failures formerly were common. Now, all-nylon tires are giving mine operators full service with no bruise or flex breaks.

Along with nylon, B. F. Goodrich uses weftless construction. This means there are no cross-threads to hamper cord action and allow some cords to stretch out. Therefore, tire growth is reduced; tires last longer.

Nylon tires always provide big savings for strip-mining, quarry and other operations where heavy loads and rough terrain have made tire costs high.

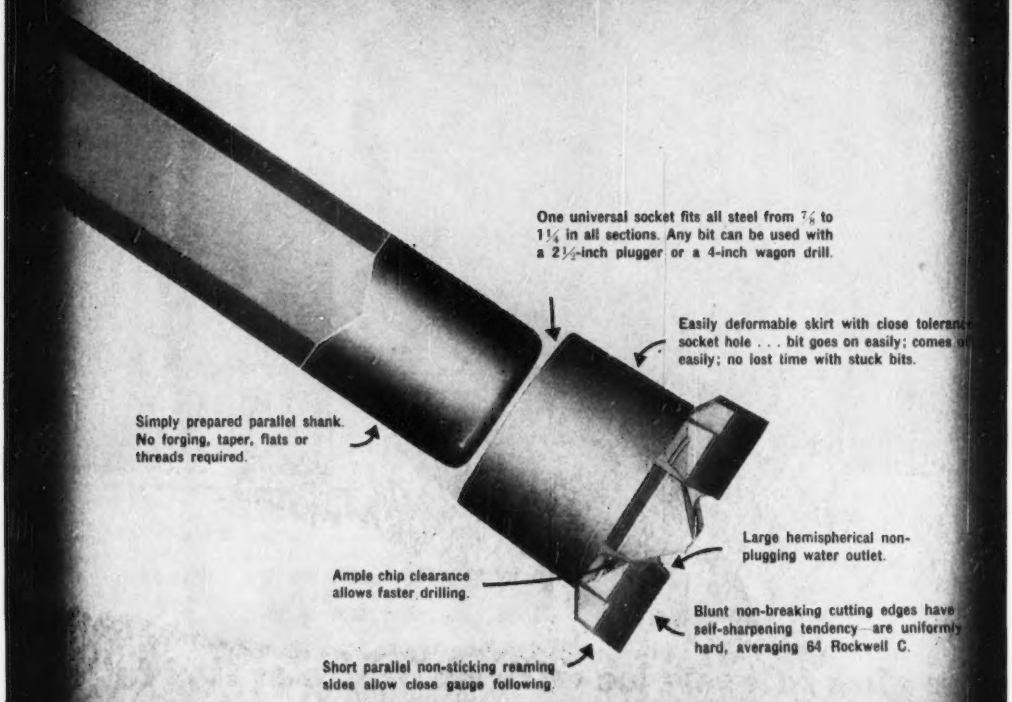
The new, all-nylon construction is typical of the continuous improvements being made in truck tires by B. F. Goodrich. Long ago, BFG engineers developed special types of tires for mining service. They constantly developed new improvements. One of these was the nylon shock shield, a major construction advancement now used in all B. F. Goodrich truck tires with 8 or more plies (double nylon shock shield in large, off-the-road tires).

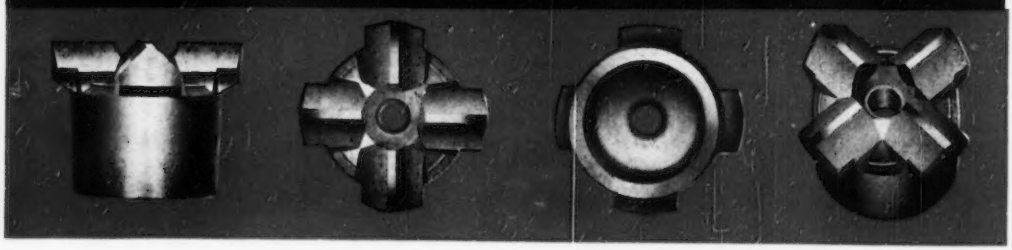
For more information on the way B. F. Goodrich tires can do more work and save you money, see your BFG dealer or write us direct. *The B. F Goodrich Company, Akron, Ohio.*

RESEARCH KEEPS
B.F.Goodrich
FIRST IN RUBBER
Truck Tires

THROWAWAY

DETACHABLE ROCK BITS


One universal socket fits all steel from 7/8 to 1¼ in all sections. Any bit can be used with a 2½-inch plugger or a 4-inch wagon drill.
Easily deformable skirt with close tolerance socket hole . . . bit goes on easily; comes off easily; no lost time with stuck bits.
Simply prepared parallel shank. No forging, taper, flats or threads required.
Large hemispherical non-plugging water outlet.
Ample chip clearance allows faster drilling.
Blunt non-breaking cutting edges have self-sharpening tendency—are uniformly hard, averaging 64 Rockwell C.
Short parallel non-sticking reaming sides allow close gauge following.



Case History Number 4

Miami Copper Company

Incorporated under the Laws of Delaware,

R. W. Hughes
General Manager

Miami, Arizona

January 10, 1950

Throwaway Bit Corporation
4200 Northwest Yeon Ave.
Portland 10, Oregon

Gentlemen:

The following data will answer your request as to our experience with the Throwaway Bits.

We have been using these bits on an experimental basis for some months and the results are such that when our present stock of other bits is exhausted we propose using your bits 100%.

The results show that we will average about 25 ft. per bit use. This compared to a 24 ft. average bit life on the conventional resharpened type in prior use (at a total cost for this 24 ft, including several resharpenings of about 60¢) makes your bit a better buy, as the following tabulation quickly shows:

Cost per ft. of drilling:

Conventional Resharpened Type	$\frac{60¢}{24'}$	= 2.5¢ Per Ft.)	A Ratio of 3.6 to 1
Throwaway Bit	$\frac{17¢}{25'}$	= 0.68¢ " ")	

Additional advantages is the smaller hole, and consequent less work on the part of the men and air drills involved and a much smaller loss on misplaced and lost bits.

Yours very truly,

J. W. Still
Mine Superintendent

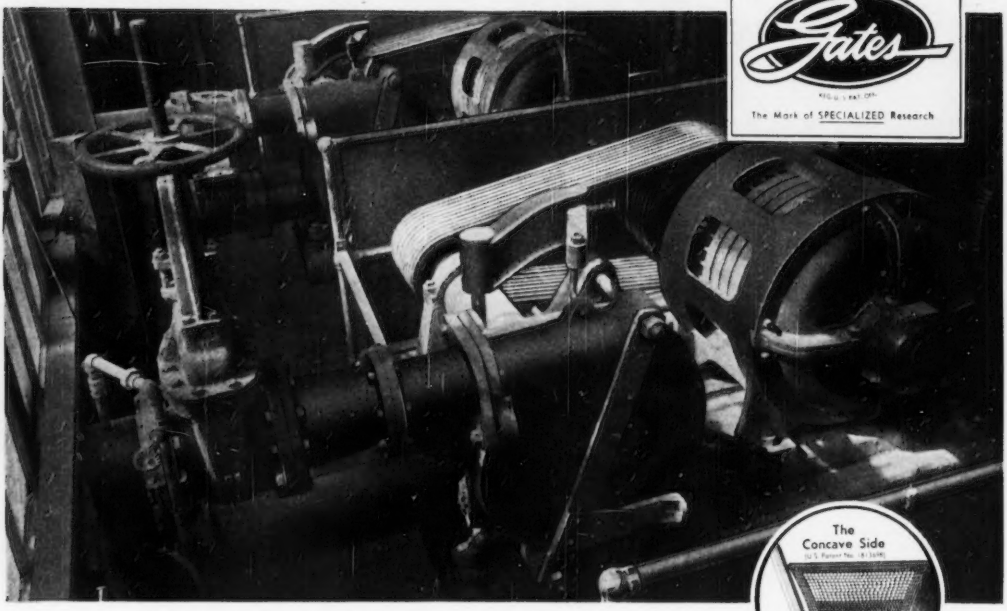
It is the company's policy to avoid grandiose, unsubstantiated claims and to offer results of actual production runs in well known mines, quarries and contracting projects as these become available. Furthermore, the company's metallurgical laboratory, backed by their field men, is constantly endeavoring to give the industry better, faster, further and easier drilling at lower cost per foot with either steel or carbide bits or both.

Fully descriptive literature on all products is available. Competent field engineers and dealers are always at your service.

THROWAWAY BIT CORPORATION

4200 N.W. Yeon Ave. Portland, Oregon, U.S.A.

Throwaway Bits, methods of manufacture, etc., and the name Throwaway are covered by patents already issued, applications for patents, design patents, trademarks, etc. Any infringement will be prosecuted to the full.



These big sand pumps handle thickened slimes at the outlet of Miami Copper's 8,000,000 gallon thickener. Operators like the Gates Vulco Rope Drives because if anything happens to a pump and the drives get wet these V-Belts, which run in grooved sheaves, do not slip off. Also, a simple change in sheave size easily provides a considerable change in pump speeds.

Two Distinct *Savings* in *V-Belt Costs* Are *Yours* with Gates Vulco Ropes

A simple test that takes less than two minutes will save you many dollars in V-Belt costs. Here it is—

Have someone bend a V-Belt exactly as it bends in going around its pulley. As it bends, grip its sides with your fingers. You will *feel* those sides *change shape*. In a straight-sided V-Belt, the sides become *convex* as the belt bends. And note how the sides *bulge out*. (Figures 1 and 1A)

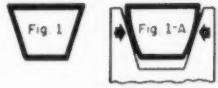
Now try the same test with a V-Belt that is built with the concave side. You will feel a change in shape—but a *different result!* The sides do not become *convex*. Instead, they become perfectly straight. *The bent belt now has a shape that exactly fits its sheave groove*—as shown in Figures 2 and 2A.

Two distinct savings result. *First*—There is no side-bulge to cause uneven wear. The sides press *evenly* against the V pulley and therefore wear *uniformly*—resulting in *longer life!* Second—The *full width* of the sidewall grips the pulley—thus carrying heavier loads without slippage—and this *saves belts* and also saves *power!*

When you buy V-Belts, be sure you get the V-Belt with the Concave Sides... the Gates Vulco Rope!

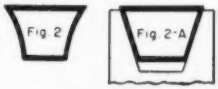
What Happens When a V-Belt Bends

Straight-Sided V-Belt



How Straight-Sided V-Belt Bulges in Sheave-Groove.

Gates Vulco Rope with Concave Side.



No Side Bulge. Precise Fit in Sheave Groove.

C S 501

THE GATES RUBBER COMPANY
DENVER, U.S.A.
The World's Largest Makers of V-Belts

GATES VULCO ROPE DRIVES
Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

WICKWIRE ROPE

A PRODUCT OF CF&I

Ask any user . . . you'll find them everywhere

In scores of industries, users of Wickwire Rope have developed an affectionate respect for its performance, safety and long life. And, for true economy, they use Wickwire's WISSCOLAY® Preformed. It lasts longer—is easier to cut, splice and install. It's kink-resistant and safer to handle. Wickwire Distributors and Rope Engineers, in key cities everywhere, are prepared to render prompt service in meeting your wire rope needs. Wickwire Rope Sales Office and Plant—Palmer, Mass.

IN THE EAST—Wickwire Spencer Steel Div. of C. F. &I.
500 Fifth Ave., New York 18, N. Y.
IN THE ROCKIES—The Colorado Fuel and Iron Corp.
Continental Oil Bldg., Denver, Colo.
ON THE WEST COAST—The California Wire Cloth Corp.
1080—19th Ave., Oakland 6, Cal.

A. E. Brotman

PIPING EQUIPMENT FOR MINE SERVICES

...FROM ONE COMPLETE LINE

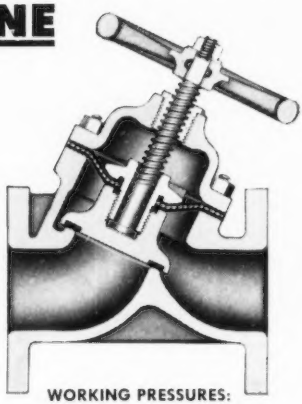
BETTER PERFORMANCE FROM DIAPHRAGM VALVES

Note how, in this new Crane design, the diaphragm is used only to seal the bonnet area—not for seating purposes. Service life of the Crane diaphragm is greatly increased because it isn't subject to cutting, crushing, and rapid wear.

The disc is a separate member which assures accurate seating and positive shut-off of flow—even in case of diaphragm failure. Other outstanding features of Crane design are greater flow capacity and easier operation in all sizes.

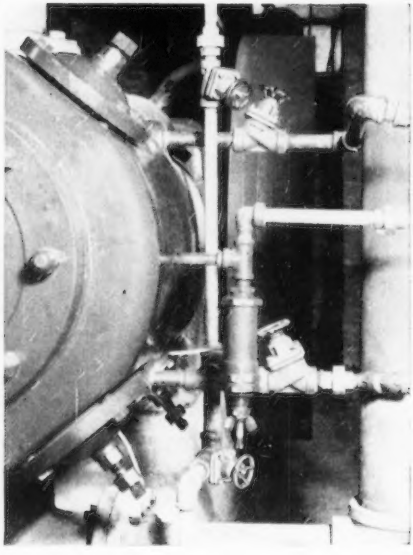
For mine waters, sludges, and slurries corrosive to iron, Crane supplies these valves with Neoprene lining. Unlined valves are highly suited for compressed air and other common mine services. Available in sizes up to 6 in.; screwed or flanged ends. Send for Circular AD-1761.

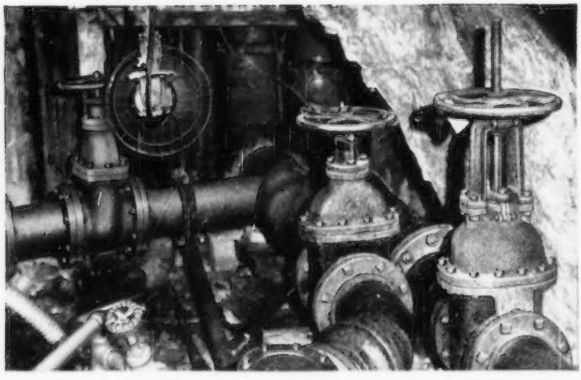
CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas



WORKING PRESSURES:
Up to 150 pounds water, oil, air, or gas; 180° F. max. temp. Sizes up to 6 in. Screwed or flanged ends.

ONE ORDER TO CRANE COVERS EVERY POWER, PROCESS, OR GENERAL UTILITY PIPING NEED

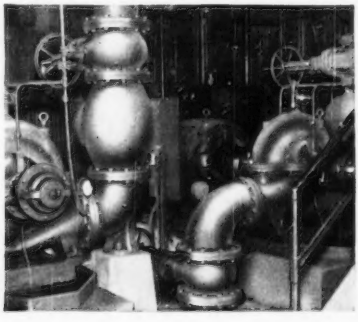




DRAINAGE LINES *in a metal mine equipped with iron valves and fittings from the complete Crane line.*

LINES TO AIR COMPRESSOR *using Crane No. 1610 Iron Body Diaphragm Valves.*

PRIMARY SPRAY PUMPS *in a large breaker plant featuring Crane 125-Pound Iron Body Wedge Gate and Check Valves.*



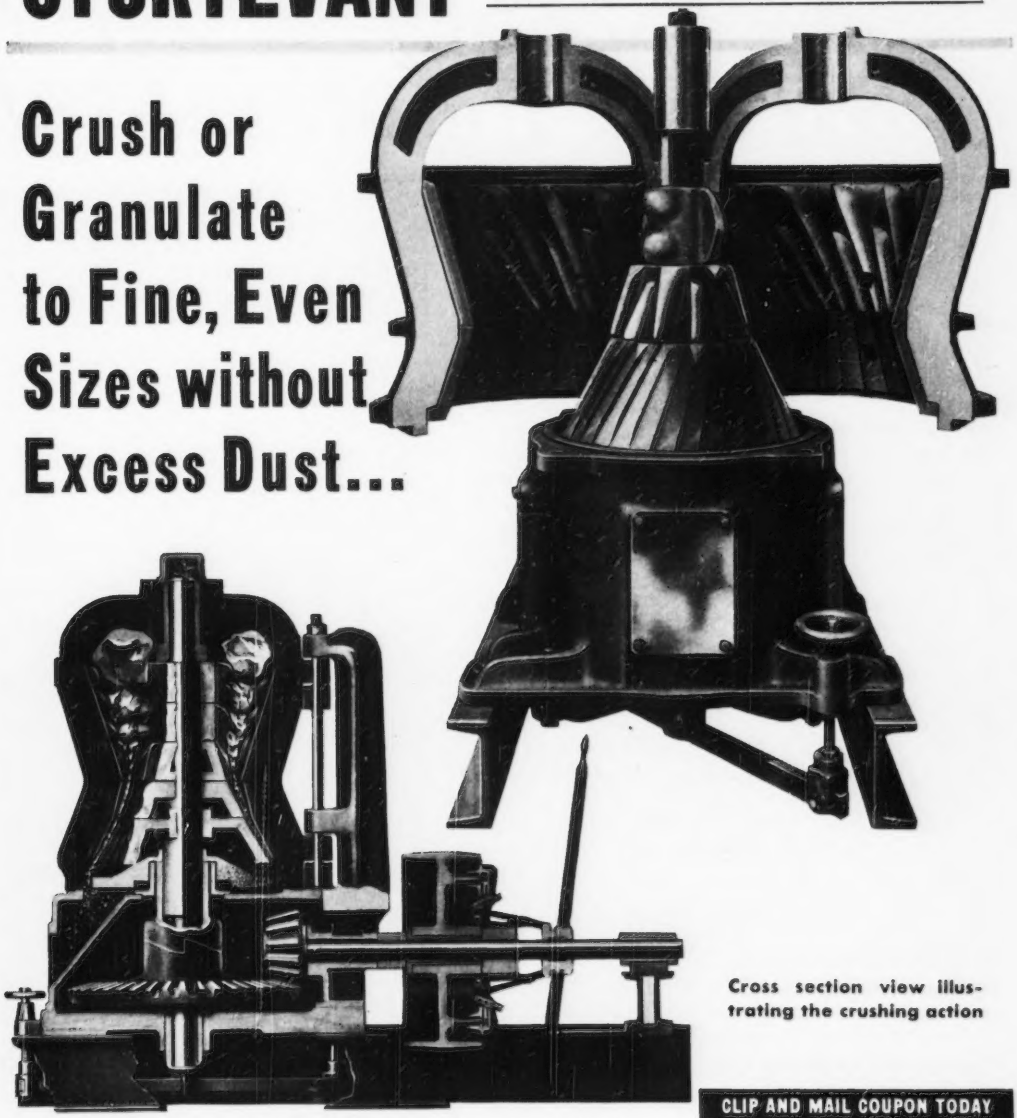
EVERYTHING FOR EVERY PIPING SYSTEM

CRANE

VALVES • FITTINGS • PIPE • PLUMBING AND HEATING

STURTEVANT ROTARY FINE CRUSHERS

Crush or Granulate to Fine, Even Sizes without Excess Dust...



Cross section view illustrating the crushing action

These rugged crushers speed output of fines, cut reduction costs. Desired fineness is quickly obtained by regulating hand wheel. "Open-door" accessibility permits fast, easy cleaning. They crush fine . . . crush fast and do not clog. Available in output capacities from 1 to 30 tons-per-hour. Write for catalog.

STURTEVANT MILL COMPANY
101A CLAYTON STREET, BOSTON 24, MASSACHUSETTS

Designers and Manufacturers of: CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

CLIP AND MAIL COUPON TODAY

Sturtevant Mill Company
101A Clayton Street
Dorchester, Massachusetts

Gentlemen:
Please send me catalog describing your Rotary Fine Crushers. I am interested in crushing _____

Name _____

Street _____

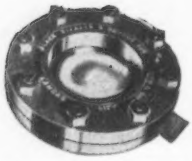
City & State _____

Firm _____

HYDROGENATION...

another outstanding example of

B S & B Leadership!

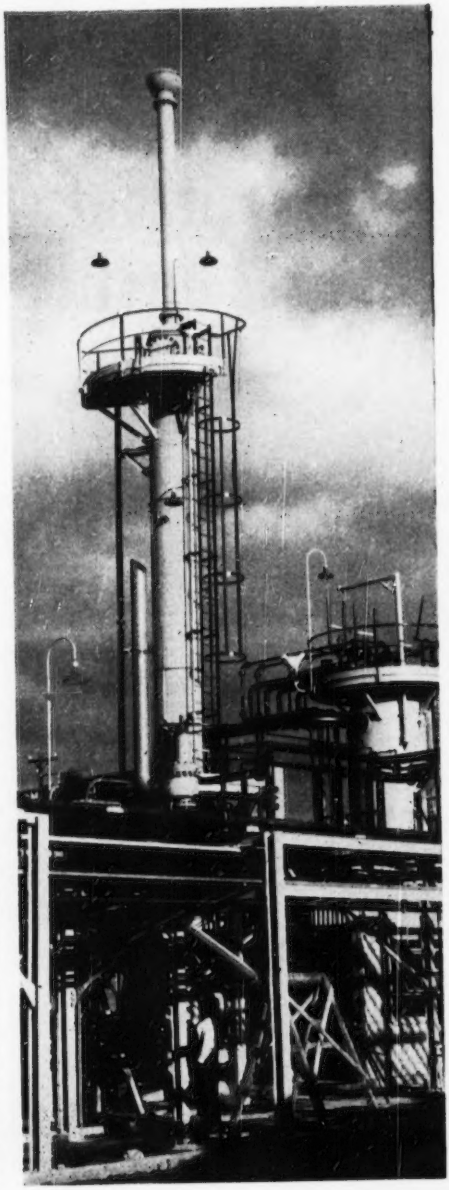


The BS&B Safety Head

Once again the experienced engineering staff and great production facilities of Black, Sivalls & Bryson are pioneering! BS&B-welded high-pressure piping in the Bureau of Mines' Hydrogenation Plant at Louisiana, Mo., is today in full operation, tested and approved for up to 15,000 psi pressure!

Seldom has there been a more severe taxing of welding strength and quality than that! Also, BS&B Pressure Vessels made to the plant's exacting specifications are in service at many points in this Coal-to-Oil pilot plant.

BS&B is proud of its contribution to such a notable experiment . . . producing petroleum from coal . . . and reminds you that these great BS&B facilities and products stand ready to assist you with *your* production problems!



Pictured at right, only a small part of this highly technical, specially designed plant.

Special Products Division, Section SPW9
BLACK, SIVALLS & BRYSON, INC.
Power and Light Building, Kansas City 6, Mo.

BS&B

● Send information about ☐ BS&B Special Fabrication ☐ SAFETY HEADS ☐ Hydrogenation plant ☐ Have sales engineer call. No obligation, of course.

NAME .....

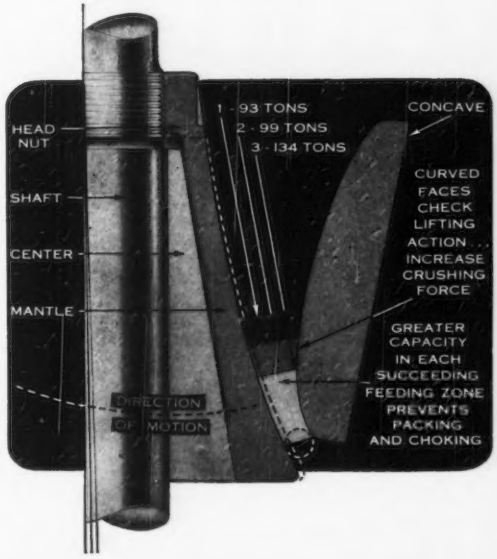
FIRM .....

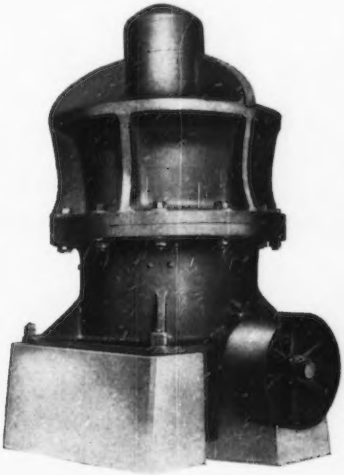
STREET .....

CITY ..... STATE .....

Efficient from feed to finish . . .
TRAYLOR TY Reduction Crushers

All Traylor TY Reduction Crushers are equipped with the non-chokable, self-tightening bell head and *curved* concaves shown in cross section at the right. From top to bottom . . . feed to finish . . . their efficiency is evident. Their top angle will nip larger rock than other secondary fine crushers. The control zone is located about midway through the crusher and has the smallest volume. Each succeeding zone has *greater capacity than the one before it.* The discharge zone is largest of all. This eliminates choking and packing as the material progresses through the crusher . . . assures exceptional capacity and continuous production. Even in the hardest service, the original shape of Traylor bell heads and curved concaves is fully retained until the metal is slowly worn to wafer thinness.





A positive, automatic, force feed lubrication system . . . safeguarded by the exclusive Traylor dust seal . . . further conserves power and reduces maintenance. Compactly designed Traylor TY Reduction Crushers are made in six sizes, filling most secondary fine crushing needs.

Tables showing the wide range of capacity of all six sizes are contained in Bulletin 4112 which fully describes all of the other features of Traylor TY Crushers. Write for your copy today.

TRAYLOR ENGINEERING & MANUFACTURING CO.
118 Mill St., Allentown, Pa.

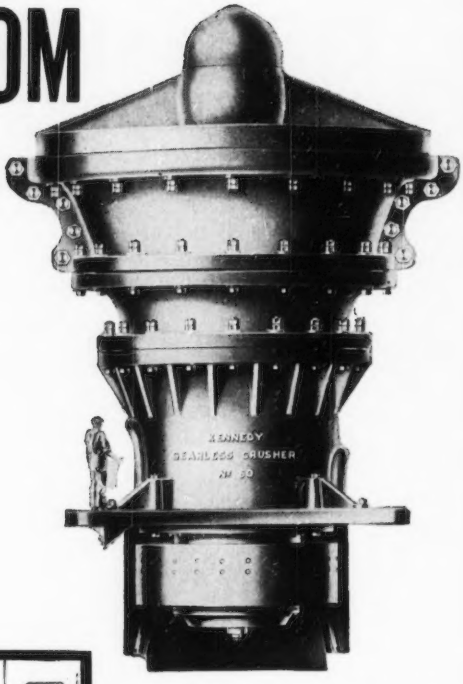
Sales Offices: New York, N. Y., Chicago, Ill., Los Angeles, Calif.
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P. Q.

Traylor

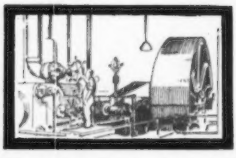
Rotary Kilns, Coolers and Dryers
Grinding Mills . Crushing Rolls
Jaw, Reduction and Gyratory Crushers

A "TRAYLOR" LEADS TO GREATER PROFITS

YOU'RE SAFE FROM POWER SHORTAGE

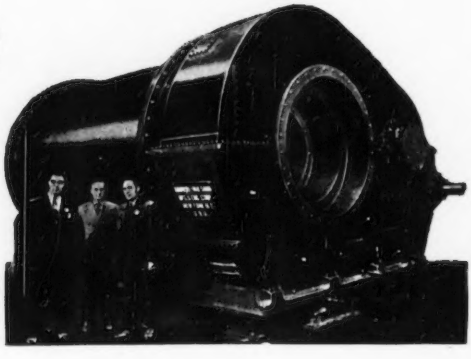


It's BAD to run short on POWER when you run a big CRUSHER. You DON'T DO THAT, ever, when you use a "KVS" Gearless. KINETIC ENERGY is exactly what gives you ADDED FREE POWER in the "KVS" Gearless Crusher for no added cost. That's the extra power that results when a big pulley or flywheel whirls around—like the big pulley on the old Corliss Engine. A BIG Pulley in the "KVS" Gearless! It whirls around at a speed of 3,500 ft. per minute —and what EXTRA crushing energy or crushing power you get! What's more, the 8-ton pulley (used in a "KVS" Crusher weighing 400,000 lbs.) whirls so easily you can turn it with TWO FINGERS! In short, more CRUSHING for LESS POWER COST, is the idea that puts "KVS" way out in front, and keeps it there!



• *Send for the* **NEW "KVS" BULLETIN**

—and you're safe from money waste



How'd you like to save about $6,000 on a 10 ft. tube or ball mill? Well, suppose you decide on a "KVS" with integral gear drive. The Kennedy INTEGRAL GEAR DRIVE enables motor to be DIRECT CONNECTED to driving shaft. Shaft is carried in roller bearings that CANNOT be misaligned or set wrong. The pinion shaft to which the motor is connected runs at approximately 600 r.p.m. while other pinion shafts run at about 180 r.p.m. ON A 10 FT. MILL THIS ENABLES YOU TO PURCHASE THE SYNCHRONOUS MOTOR AT A SAVING OF ABOUT $6,000. What's more, "KVS" trunnions on large sized tube and ball mills are CARRIED ON OIL. The bearing never wears out, uses little power. All gears and bearings are automatically sprayed with oil before tube mill is started (Design patented). Believe it or not, in 15 years no "KVS" gears or pinions have worn out on this type mill.

"THE PRODUCTS WITH THE TROUBLES LEFT OUT...

YOU'RE SAFE FROM DOUBT

when you read these figures:

SPEAKING OF CRUSHING . . . .

LOCATION: NATIONALLY KNOWN MINING CO. IN NEW YORK STATE

CRUSHERS: FOUR NO. 37½ KENNEDY TYPE "S" ROLLER BEARING GYRATORY CRUSHERS

FEED OPENING: 6¼"; **DIAMETER OF HEAD:** 3 FEET

DISCHARGE SETTING: 7/32" CLOSED SIDE AT HEAD

CAPACITY EACH CRUSHER: 56 TONS PER HOUR

HORSEPOWER EACH CRUSHER: 48 HP.

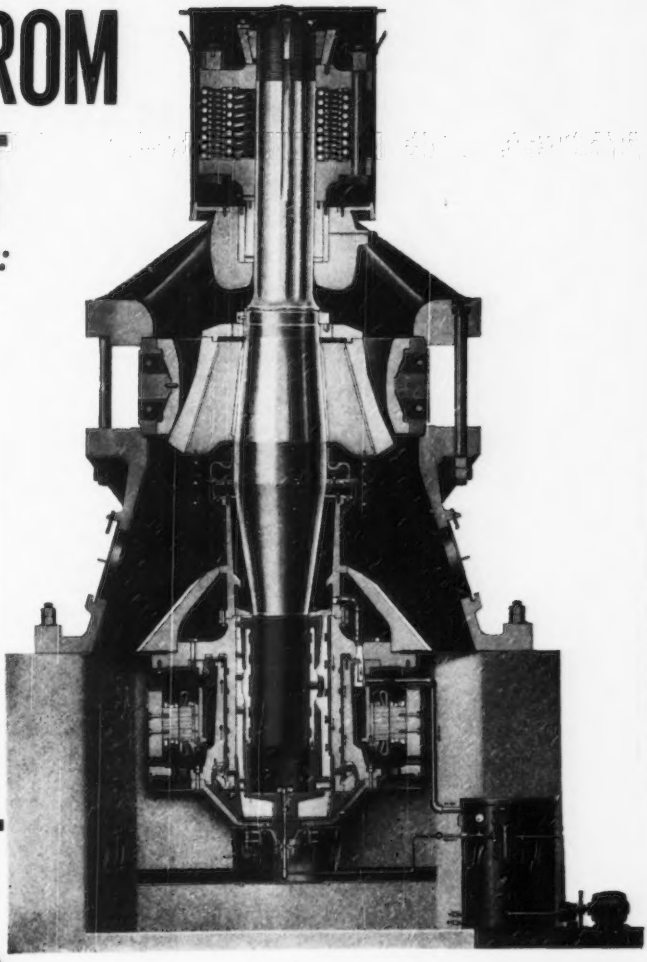
CLOSED CIRCUIT OPERATION

GRADATION AS FOLLOWS:

THE FIGURES!

99.8%	Minus	3	MESH
93.3	"	4	"
80.6	"	6	"
66.6	"	8	"
56.1	"	10	"
48.1	"	14	"
40.6	"	20	"

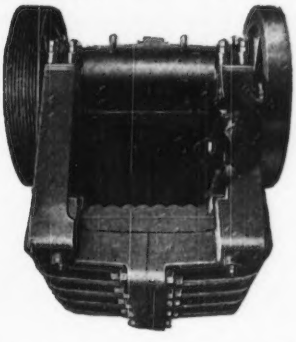
Can You Equal These Figures?



—and safe from

waste *energy . . . .*

ENERGY expended to keep a swing jaw crushing is WASTED if ALL the load goes on ONE jaw! So, in the "KVS", both swing jaw and stationary jaw are set at the same inclination. Stationary jaw carries fully 50 percent of load . . . result, you need LESS POWER to keep the swing jaw swinging and crushing. Note another thing—the swing jaw is all ONE PIECE, except renewable crushing plate. Also swing and stationary jaws are interchangeable, both the same length, and reversible end-for-end, giving twice as much crushing life before renewal is needed.



Kennedy-Van Saun

MANUFACTURING AND ENGINEERING CORPORATION

2 PARK AVE., NEW YORK 16, N. Y.

FACTORIES:
DANVILLE, PA., U.S.A.
CANADA, ENGLAND, FRANCE, AUSTRALIA

THE MARKS OF

Fine Drill Steel

You can make sure you're using Bethlehem by looking for the "A" and "B" markings in groups of six which are rolled on every bar of drill steel at 30-in. intervals. These smooth, raised letters have no sharp lines that could serve as origins for fatigue cracks. Having six marks in a group assures ready identification, even after a bar has seen rough service.

Hard-rock men who have compared drill steels have learned to identify Bethlehem Hollow by its consistently top performance. The bar markings are added assurance of your getting what you specify.

β for Carbon

This fine-quality carbon steel is the standard type of drill steel, the "Old Reliable." It's easy to forge, and its wide quenching range assures easy heat-treatment. Ideal for either forged-on or detachable bits. It stays on the job because it has the dependable quality which stems from controlled hardenability and rigid inspection, a technique we've perfected to insure uniform toughness, long wear and fatigue-resistance.

a for Alloy

This excellent alloy grade, developed to give better service as drill rod for use with detachable bits, has been thoroughly proved by many users who prefer the alloy type of drill steel. It cannot be used for forged-on bits. Its extensive use has demonstrated the fine performance that can be expected when it is properly heat-treated. Developed first by Bethlehem, this alloy drill steel meets I-R Specification 139.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM HOLLOW DRILL STEEL

BETHLEHEM STEEL

Specify Thermoid Steam Hose

Powerflex Wire Braid Steam Hose

Unequalled for strength and flexibility, it offers more capacity, greater safety, longer wear. The tough, thick, heat-resisting inner tube is of specially compounded black rubber . . . high-tensile steel wire braids safeguard against bursting . . . asbestos braid dissipates heat and firmly bonds the cover to the hose body. Special cover is heat and abrasion resistant. Furnished in sizes from ½" to 2½", in lengths up to 50 feet. An all-purpose steam hose for all pressures up to 200 psi.

Hi-Temp Steam Hose

Mandrel-built—special heat-resisting rubber tube . . . braided asbestos-yarn reinforcement . . . heat and wear resistant cover. Furnished in sizes from ½" to 2" inside diameter in 25 or 50 foot lengths. A lighter weight all-purpose steam hose for superheated steam up to 200 psi.

#300 Steam Hose

Heat-resisting rubber tube. Cotton fabric reinforcement. Heat and wear resistant cover. Furnished in sizes ½" to 2½", in 25 and 50 foot lengths. For general service where steam pressure does not exceed 150 psi.

These latest developments in steam hose are typical of the results obtained through Thermoid's continuing research and study of product applications. Thermoid's planned program of product research and development assures you of maximum service and lowest operating costs whenever you specify Thermoid Industrial Rubber Products.

It will pay you to *Specify* Thermoid!

Thermoid Quality Products: Transmission Belting • F.H.P. and Multiple V-Belts • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Molded Products • Industrial Brake Linings and Friction Materials.

Thermoid Company

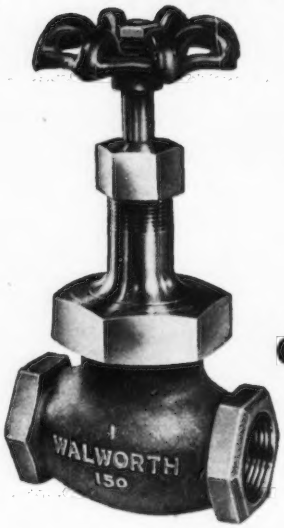
Main Offices and Factory • Trenton, N. J., U. S. A.
Western Offices and Factory • Nephi, Utah, U.S.A.
Industrial Rubber Products • Friction Materials • Oil Field Products

Toothed Lock Washer: Prevents loss of stem nut due to vibration, thereby holding the handwheel securely.

Newly Designed Handwheel: Air-cooled, finger grip handwheel affords sure grip even with greasy gloves.

Improved Packing: Molded packing of lubricated asbestos reinforced with copper wire. Suitable for practically every service. Valves can be repacked under pressure.

WALWORTH



IMPROVED
No. 95
BRONZE
GLOBE VALVE

also available in Angle Type (No. 96)

The service ratings of the Walworth No. 95 are 150 pounds per square inch steam at 500F, and 300 pounds per square inch non-shock cold water, oil, and gas. In the manufacture of this quality bronze valve, more than 47 gages are used in machining parts to micrometric accuracy, thus insuring interchangeability of parts. For further information see your local Walworth distributor, or write: Walworth Company, 60 East 42nd St., New York 17, N. Y.

note these 7 Great Features

Hexagonal Union Bonnet Connection: Eliminates any chance of distortion or leakage even though valve is repeatedly taken apart and assembled.

WALWORTH
valves and fittings

60 EAST 42nd STREET NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

New Cylindrical Disc Holder: The design of the top portion of the disc holder keeps the disc accurately guided under all operating conditions.

Renewable Asbestos Disc: This disc is suitable for steam up to 500F and is resistant to oil, gasoline, and many chemicals at atmospheric temperatures. Discs for special services are available.

Extra Strong Body: Made of Composition M (ASTM B61) bronze thick enough to provide a high safety factor. Valves undergo hydrostatic shell test of 450 psi.

New TIMKEN® "Spiralock" rock bit offers more advantages than any other one-use bit!

1 STAYS ON MORE DEPENDABLY. New "Spiralock" union*—formed by square socket that spirals slightly as it recedes—has proved superior under actual on-the-job conditions.

*PATENT PENDING

2 EASIER TO GET ON AND OFF. A few blows of the drill and it's on. A few blows of a hammer and it's off. Smooth socket contours assure easy detachability.

3 MADE OF TIMKEN ELECTRIC FURNACE STEEL. Fast cutting. Long lasting. Has high resistance to wear and abrasion and the toughness to withstand constant pounding. Uniform quality.

4 NON-RIFLING. The "X" cutting edge prevents rifling in any ground.

5 CROWNED CHISEL PILOT. Easier starting and collaring.

6 SIMPLIFIES PREPARATION OF DRILL STEELS. Due to "Spiralock" union, steels last much longer, are easier to prepare and recondition. Square steel ends simplify fitting. They may be machined or forged.

7 ANY STEELS CAN BE USED. Existing drill steels of any size and section can be easily and quickly adapted.

ALL these advantages of the Timken* one-use "Spiralock" rock bit have been proved under actual on-the-job conditions. They are unequalled by any other one-use rock bit.

This revolutionary new bit is designed for drilling jobs where bit reconditioning is impractical or undesirable. It is available in a variety of types and sizes.

The one-use "Spiralock" bit is the latest addition to the famous Timken rock bit line, which includes the widely-used Timken threaded carbide insert and multi-use bits. Remember, Timken is the *only* company that offers you *all three* types.

For help in choosing the right bit for your particular job, use the 17-year experience of our Rock Bit Engineering Service. Write to The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

YOUR BEST BET FOR THE BEST BIT ... FOR EVERY JOB

1 Timken threaded multi-use rock bit.

2 Timken threaded carbide insert rock bit.

3 Timken one-use "Spiralock" rock bit.

Two 35-in. dia. by 30-ft Allis-Chalmers log washers.

How Log Washers May Mean Added Profits for You...

WELL-WASHED products meet higher cleanliness specifications, may cut costs of further processing.

The double rows of steel paddles you see in these Allis-Chalmers log washers effectively remove medium sticky clays from stone, sand and gravel, iron, zinc, bauxite, phosphates and other ores.

They revolve toward each other, produce a vigorous *scuffing* action. In addition, feed and wash water flow counter-current, producing a *scouring and sluicing* action. Result is a cleaning job that removes essentially all clay and dirt.

CHECK THESE FEATURES

- High carbon steel log paddles are secured by two bolts, easy to remove.
- Clear-water-lubricated rubber sleeve marine type bearings on lower end.
- Extra motor sheaves are provided to give different log shaft speeds.
- Cut tooth steel gears enclosed in oil-tight case result in increased gear life and safety for operator.
- Entire unit is rigid — drive frame assembly is welded to upper end of tank, mounted on common base.

Besides log washers, Allis-Chalmers builds a *complete line* of washing equipment for *any* application: Blade mills, for larger sizes of materials containing tenacious clays . . . sand screw washers, for washing and dewatering rock or ores in sizes ½-inch or smaller . . . revolving scrubbers and screens.

The Allis-Chalmers representative in your area may be able to show you how modern washing equipment can save you money. Call him, or write for log washer Bulletin 07B6411. A-2925

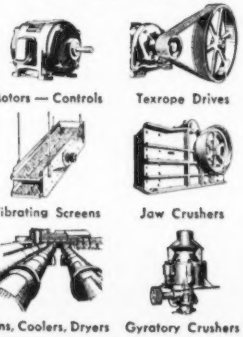
Texrope is an Allis-Chalmers trademark

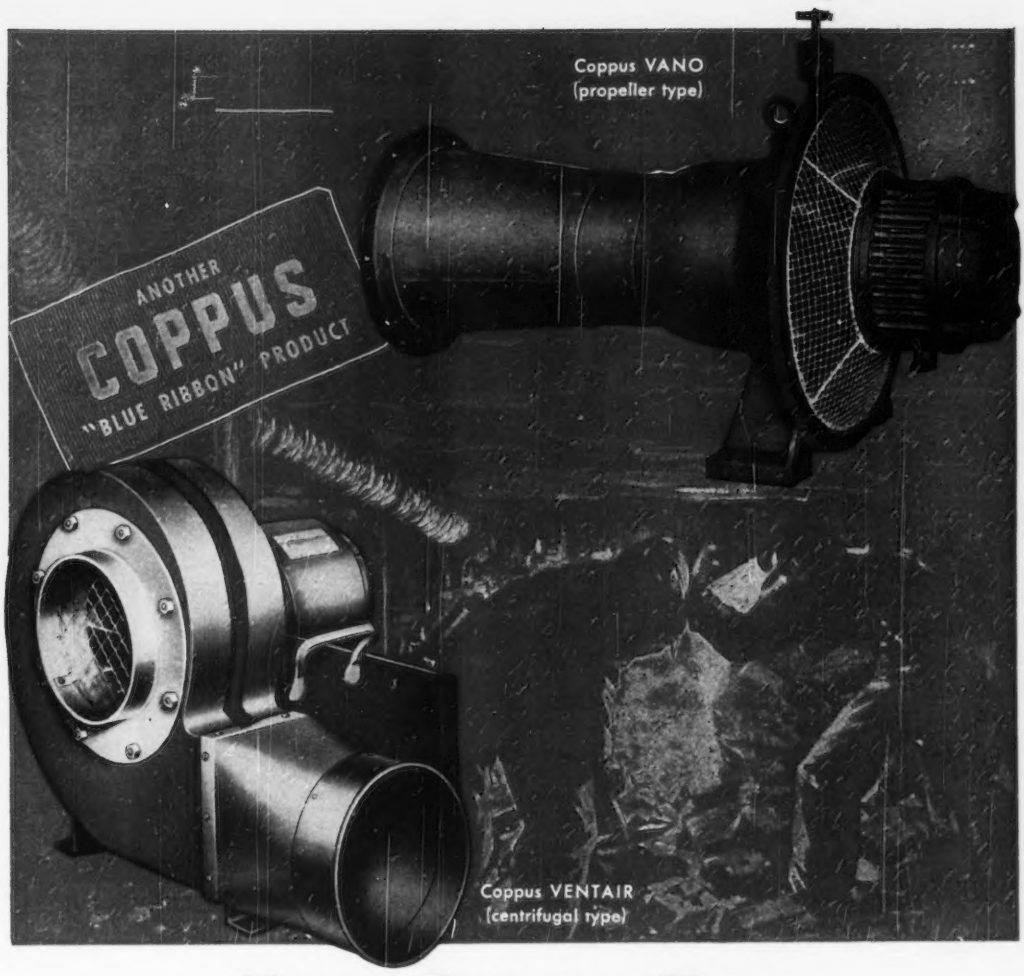
ALLIS-CHALMERS, 969A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

Sales offices in principal cities in the U. S. A. — Distributors throughout the world.

IT PAYS TO SPECIFY MOTORS... CONTROLS... V-BELT DRIVES—ALL FROM ALLIS-CHALMERS





Choose Between Them and Get 30% to 100% More Air

Coppus Blowers are designed for two different types of mine ventilation requirements: the centrifugal Coppus **VENTAIR** is for long pipe lines; the propeller-type Coppus **VANO** for shorter lines . . . the correct selection will give you from ½ more to twice as much air — for a given power consumption — than an ordinary all-purpose fan.

Available for either compressed air or electric motor drive, both can be used as blowers or exhausters and are obtainable in capacities up to 90,000 CFM.

Only Coppus makes both these types, one of which will give you better, more economical mine ventilation . . . know them by the "Blue Ribbon" that symbolizes the engineering and production skill behind every Coppus product.

Representatives listed in MINING CATALOGS. Other Coppus "Blue Ribbon" products: steam turbines, gas burners, heat killers, air filters, blowers and exhausters for special purposes. See also THOMAS' REGISTER . . . Coppus Engineering Corporation, Worcester 2, Massachusetts.

COPPUS ENGINEERING CORPORATION
282 Park Avenue, Worcester 2, Mass.

Please send.....Bulletin 130

Name .....

Company .....

Address .....

RIGHT
FROM
THE START
THIS PROPOSAL SAYS TO BUY TRUNION OVERFLOW MILLS. THEN, IF WE DON'T GET CAPACITY, ADD GRATES.
WHAT? THEN TEAR OUT FOUNDATIONS AND BUY ALL NEW MOTORS AND DRIVES ? I CAN SEE THE BOSS IF HE GOT A BILL FOR THAT!
OKAY, THEN LET'S GET SOME MORE MARCY GRATE DISCHARGE MILLS AND BE SURE WE'RE RIGHT.
YEAH, MARCYS HAVE ALWAYS GIVEN US LOWER POWER AND STEEL COSTS, WITH LOWER OVERALL GRINDING COSTS.

OTHER PRODUCTS

Massco Fahrenwald Flotation Machines; Genuine Wilfley Tables; Massco-McCarthy Hot Millers; Rock Bit Grinders; Density Controllers; Belt Feeders; Pinch Valves; Assay and Laboratory Supplies and Equipment; Complete Milling Plants; Constam Ski Lifts.

Main Office: DENVER, COLORADO, U.S.A.; El Paso; Salt Lake City; 1775 Broadway, New York, N. Y.; Canadian Vickers, Ltd., Montreal; W. R. Judson, Santiago and Lima; The Edward J. Nell Co., Manila, P. I.; The Ore & Chemical Corp., 80 Broad St., New York 4, N. Y., Representatives for Continental Europe.

THE **Mine & Smelter** SUPPLY COMPANY

TRUCKS and SHOVELS keep on the *move*

when you detonate with PRIMACORD

You can figure on better digging when you shoot with Primacord. *Operations speed up all along the line.*

Primacord does this with a combination of forces that team up to give you more complete fragmentation. Down-hole lines initiate the whole charge instantly, from top to bottom, with all the power of primer cartridges. Main lines can be laid out so that front holes go a split second before succeeding ones, allowing for planned relief of burden.

You can get Primacord, wound on easy-to-handle spools, in a grade to meet every blasting condition. It's insensitive to stray currents, and hooks up as fast as you can tie square knots or half hitches. Ask your supplier about Primacord, or write direct to The Ensign-Bickford Company, Simsbury, Connecticut.

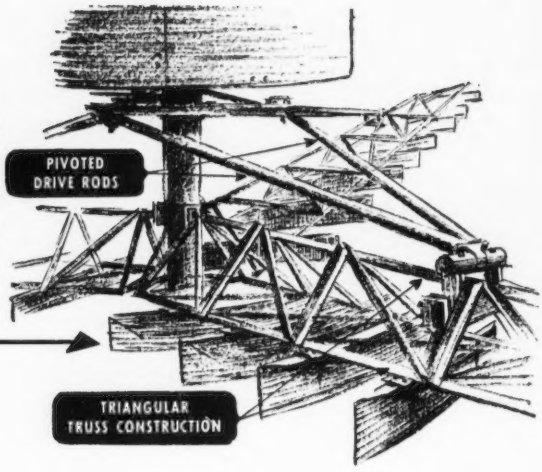
P-23

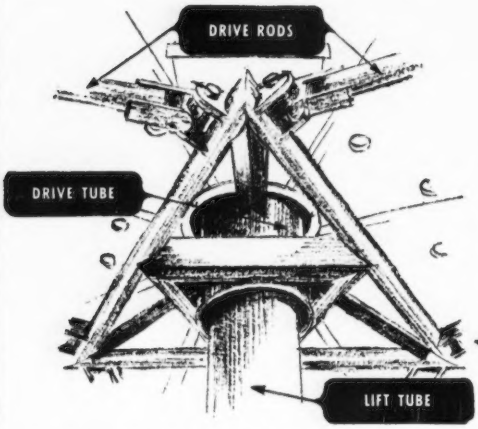
PRIMACORD-BICKFORD Detonating • Fuse •

Also Ensign-Bickford Safety Fuse Since 1836

Here's why DORR TYPE H Hydroseparators and Thickeners can take **tough, heavy-duty** operation . . .

Key to Type H strength and rigidity is triangular construction . . . the basic structural principle of the three-legged stool. Note that the Type H has three rake arms . . . each constructed of triangular trusses. Note, too, the two pivoted drive rods for each arm and how they too form triangles with the center truss as shown in the sketch at the right.

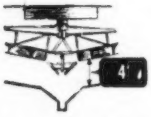




In the closeup sketch at left, the series of triangular trusses connecting the drive rods to the central drive tube are clearly shown. *All* structural supporting members form triangles . . . providing a pattern of rigid strength to withstand heavy torque loads.

Powered by a heavy-duty balanced spur-gear drive, Dorr Type H Hydroseparators and Thickeners are now available in sizes ranging from 50 to 100 feet in diameter. Single units will handle 100 to 1,000 tons of solids per hour. May we give you further information?

PLUS THESE IMPORTANT FEATURES . . .



AUTOMATIC HYDRAULIC LIFT
For overload protection, an automatic hydraulic lifting device is provided, activated by the torsional load on the mechanism. Lift tube and rakes raise quickly . . . up to four feet—when an overload is encountered . . . lower slowly as the overload is reduced.

FREE, CENTER CONE DISCHARGE
Entire rake and drive mechanism is supported by a truss spanning the tank. Result . . . free, center cone discharge . . . no impaction of heavy solids in the discharge cone.

DORRCO

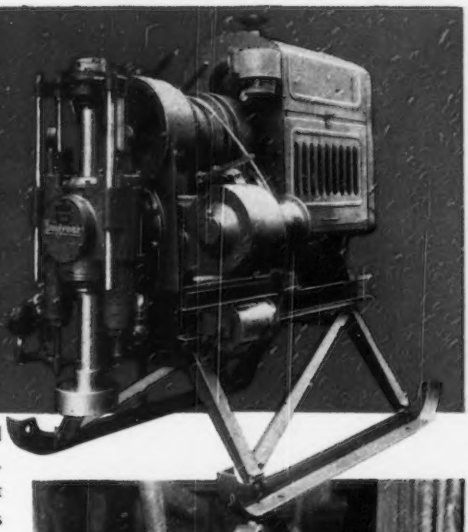
THE DORR COMPANY, ENGINEERS
BARRY PLACE, STAMFORD, CONN.
NEW YORK • ATLANTA • TORONTO
CHICAGO • DENVER • LOS ANGELES
RESEARCH AND TESTING LABORATORIES
WESTPORT, CONN.
SUGAR PROCESSING
PETREE & DORR DIVISION, STAMFORD, CONN.
ASSOCIATES AND REPRESENTATIVES
Dorr Technical Services and Equipment Are Also Available Through Associated Companies and Representatives in the Principal Cities of the World. Names and Addresses on Request.

DORR
RESEARCH — ENGINEERING — EQUIPMENT

IT'S THE

Built-in Quality

THAT COUNTS



That's why Longyear insists on selected materials, and precision machining in building diamond core drills. Here are examples of parts or processes that must meet critical tests: sound castings, high-grade alloys for gears and shafts, perfect alignment, precise tolerances, quality bearings, thorough lubrication. These features give Longyear drills endurance, steady performance, economical operation. Select any Longyear model and know that goodness goes all the way through.

ECONOMY RESULTS FROM BUILT-IN QUALITY

The Junior and UG Straitline core drills illustrated are popular models. They repeatedly demonstrate to users the value of sound internal construction. Operators are getting STEADY DRILLING PERFORMANCE, and LARGER FOOTAGES per shift because there are no break-downs due to inferior materials or workmanship. These factors add up to OPERATING ECONOMY. The word gets around. That is the reason for new orders, and why repeat orders keep coming in. Think it over and let us quote you on suitable drill equipment for your next job.

CORE DRILLS AND SUPPLIES

Longyear manufactures a complete line of core drills—large or small, for surface or underground use. There is a quality-built model suited to your needs.

Also, quality-built diamond drill accessories and standard supplies are available from stock.

Write us for specific information.

Upper Picture—Junior Straitline, Diesel Driven
Capacity: 1000′ of EX core or 800′ of AX core

Lower Picture—UG Straitline, Air Driven
Capacity: 2000′ of EX core or 1600′ of AX core

Each model is equipped with screw feed or hydraulic drilling head; also may be supplied with air, electric, gasoline or Diesel motive power.

Remember, we do core drilling under contract. You may prefer to use this service rather than to buy drills. Consult us on your requirements.

E. J. LONGYEAR COMPANY

MINNEAPOLIS, MINNESOTA, U.S.A. NEW YORK OFFICE, 1775 BROADWAY

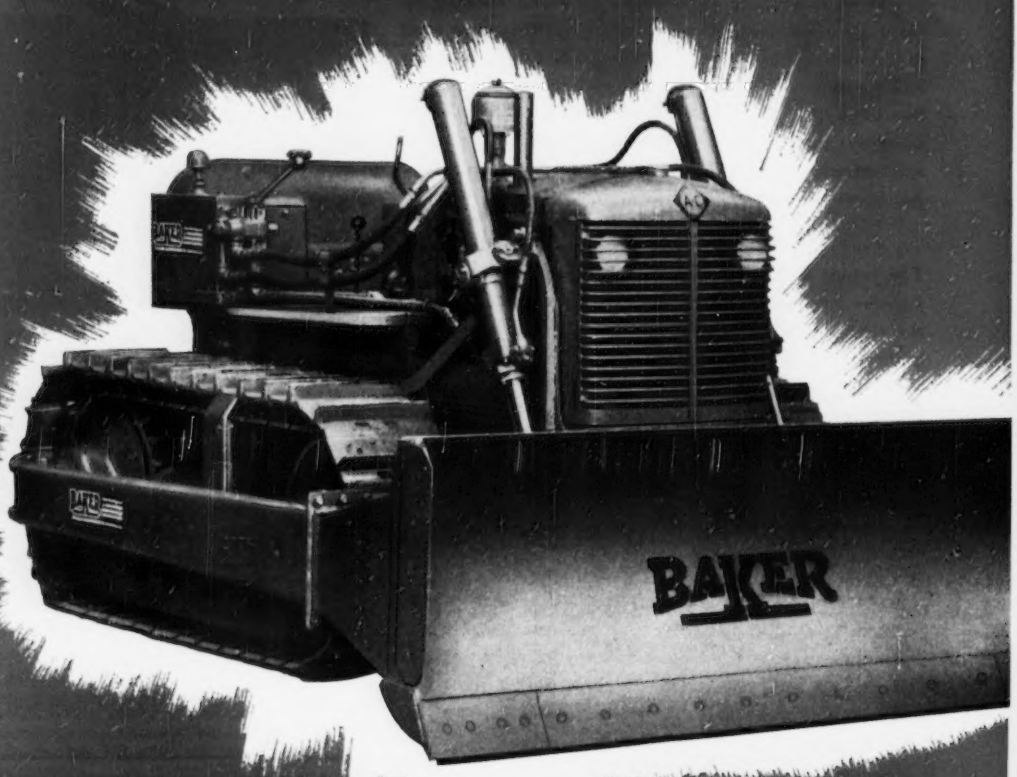
CANADIAN LONGYEAR, LIMITED, NORTH BAY, ONTARIO, CANADA

DIAMOND CORE DRILLS • CONTRACT CORE DRILLING
SHAFT SINKING • GEOLOGICAL INVESTIGATIONS

REPRESENTATIVES IN PRINCIPAL MINING CENTERS IN THE UNITED STATES AND OTHER COUNTRIES

NEW! BAKER engine

for the ALLIS-CHALMERS



mounted Bulldozers and Gradebuilders

HD-5 TRACTOR

They're here — sensational, new Baker Bulldozers and Gradebuilders, ready for your job whatever it may be within the range of the Allis-Chalmers HD-5 tractor. They're engine mounted and they pack a terrific wallop — they're well balanced, extra sturdy, and built for big volume, tough earthmoving.

This new Baker design brings you everything you've always wanted in a bulldozer — the simple, fast acting, most dependable hydraulic control system in the business — fingertip, precision control of the blade — unimpaired visibility—direct lift with plenty of down-pressure for tough digging — extra operator comfort and convenience, and balance that converts every ounce of tractor power into push on the blade.

Built into the HD-5, these new Bakers provide new standards of performance, economy and all-around utility. Before you buy ANY bulldozer, check over these new Bakers at your Allis-Chalmers dealer or write direct for Bulletin 881. Baker Mfg. Co., Springfield, Illinois.

C'MON, IT'S HERE... THE NEW P&H 955-A!
NO MORE FRICTION SWING CLUTCHES FOR ME...TRA-LA!
SEE THOSE FAST STOPS AND STARTS? WITH HYDRAULIC CONTROL SHE'S SMOOTHER ALL AROUND
BOY! THIS IS IT! MAGNETORQUE* ELECTRIC SWING ON A 2½ YARD SHOVEL
IT'S A CONTRACTOR'S DREAM FOR BIGGER YARDAGE...LOWER COSTS, TOO!
RUGGED? THIS BABY HAS IT.. JUST LIKE THE 1055!
P&H

Yes, the new 955A is a standout. And almost a sellout, too! This 2½ yard shovel, a smaller version of the famous P&H Model 1055, can be shipped completely assembled. Lower digging costs in 2½ yd. capacity are important to you, so it's important that you check the P&H 955A right now. Get your copy of bulletin X-122 now!

*Trademark of Harnischfeger Corporation for electro-magnetic type clutch

P&H

EXCAVATORS
4454 West National Ave.
Milwaukee 14, Wis.

HARNISCHFEGER CORPORATION

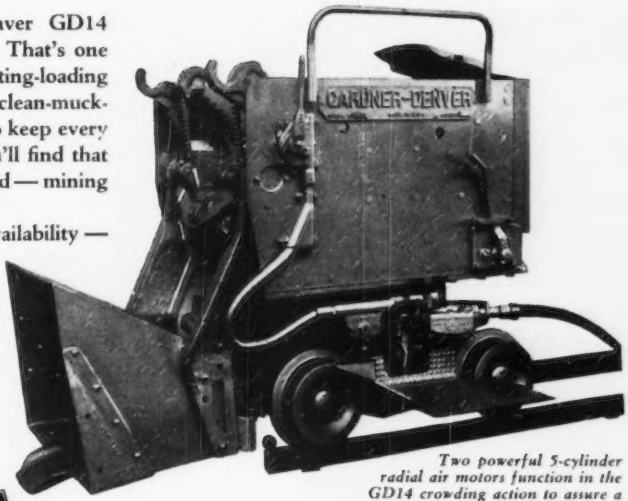
LOOK TO P&H FOR ADDED VALUES

Excavators • Overhead Cranes • Hoists • Arc Welders and Electrodes • Soil Stabilizers • Crawler and Truck Cranes • Diesel Engines • Cane Loaders • Preassembled Homes

Q. HOW CAN I GET A FASTER CYCLE IN EVERY HEADING?

A. Let Gardner-Denver GD14 Mine Car Loaders handle the mucking. That's one good way to speed up the drilling-blasting-loading cycle in every heading. With these fast, clean-mucking loaders, you can schedule the work to keep every loader busy throughout every shift. You'll find that productivity and efficiency are increased — mining costs are lowered.

GD14 Loaders give you full-time availability — as proved by their performance in hundreds of mining installations. Gardner-Denver *master engineering* features provide speed for the job and safety for the man. Get all the facts — send today for Bulletin MCL.



Two powerful 5-cylinder radial air motors function in the GD14 crowding action to assure a full dipper every time.

USE COMPRESSED AIR FOR SAFETY CONVENIENCE FLEXIBILITY

SINCE 1859

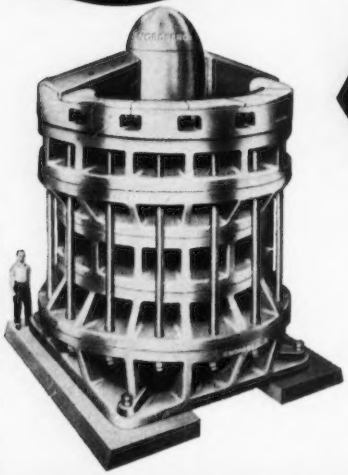
GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada:
Gardner-Denver Company (Canada), Ltd., Toronto, Ontario

BIG NORDBERG MACHINERY
for Reduction of Metallic Ores

THESE three machines are typical examples of Nordberg engineering and development of big machinery for crushing and processing operations. This Nordberg machinery is used all over the world by efficient operators.

For complete details, write for illustrated literature.



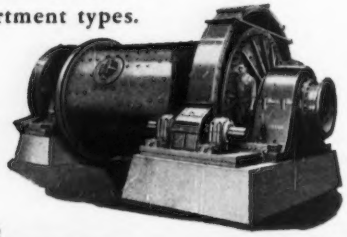
NEW NORDBERG 54" GYRATORY CRUSHER

HERE'S the answer to your biggest primary crushing problems. This huge 54" Nordberg Gyratory Crusher is the most massive machine of its size and type ever built. Designed for extremely heavy duty service under the most severe operating conditions. Built with cast steel main frame reinforced with large diameter tie rods. Each bearing independently pressure lubricated with temperature-controlled filtered oil.

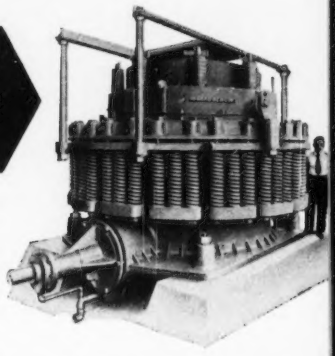
Nordberg Gyratory Crushers of the heavy duty type are built in sizes ranging from 30" to 72" feed openings to meet your every production requirement.

NORDBERG 10'8" x 17'0" GRINDING MILL

THIS is the largest diameter Grinding Mill of its length ever built. This huge mill is but one of numerous Nordberg Grinding Mills for wet or dry grinding. There is a complete line of large Nordberg Grinding Mills available in ball, rod, tube, pebble and compartment types.



SUPERHEAVY DUTY 7' SYMONS CONE CRUSHER



HERE is the most rugged and heaviest Symons Cone Crusher ever built. Symons Cone Crushers are known everywhere for their production of greater quantities of sized products, within close control limits, with trouble-free low cost operation. There is a Symons Cone Crusher best adapted to meet your problems of providing a uniformly fine mill feed for sustained high production. Available in Standard, Short Head, and Intermediate types.

NORDBERG MFG. CO.
MILWAUKEE 7, WISCONSIN

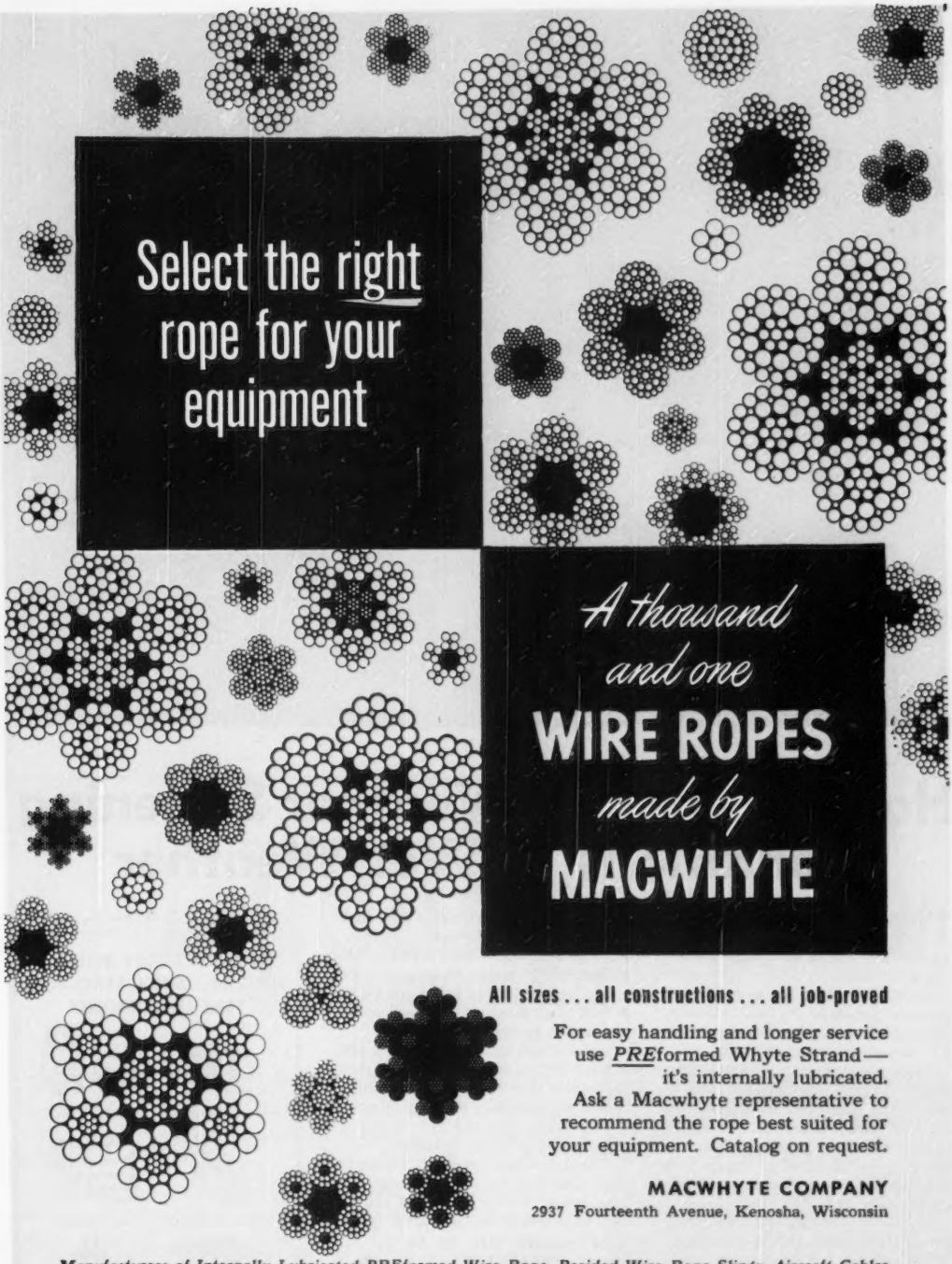
NEW YORK • SAN FRANCISCO • WASHINGTON • SPOKANE
MEXICO, D. F. • LONDON • TORONTO • JOHANNESBURG

NORDBERG MACHINERY

M502

NORDBERG

Machinery for processing ores and industrial minerals



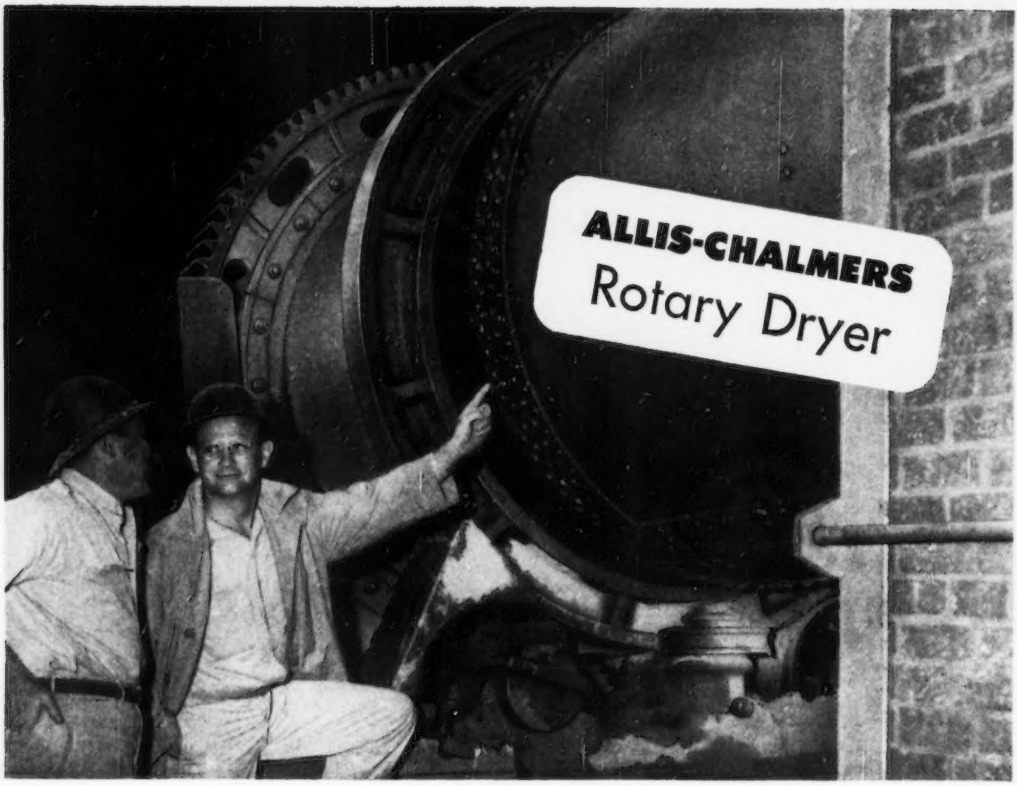
All sizes . . . all constructions . . . all job-proved

For easy handling and longer service use *PRE*formed Whyte Strand—it's internally lubricated. Ask a Macwhyte representative to recommend the rope best suited for your equipment. Catalog on request.

MACWHYTE COMPANY
2937 Fourteenth Avenue, Kenosha, Wisconsin

Manufacturers of Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cables and Assemblies, Monel Metal and Stainless Steel Wire Rope. Our distributors and mill depots throughout the U.S.A. and other countries carry stocks for immediate delivery. Mill depots: New York • Pittsburgh • Chicago • Minneapolis • Fort Worth • Portland • Seattle • San Francisco • Los Angeles

070



How To Get Dry Weather Screening Conditions in Wet Weather

THIS ROTARY DRYER keeps screening operations at peak performance during the wet season at a large Eastern limestone plant.

Installed 12 years ago to reduce the moisture content of crushed limestone, this direct heat counter-flow dryer handles 40 tons of stone per hour.

Drying is uniform. Internal lifters shower material through a stream of hot drying gases, effectively reducing moisture content of minus 7/32-in. material to optimum conditions for screening. Slowdowns caused by screen cloth blinding when handling damp materials are avoided.

Besides high drying efficiency, you'll get all these features when you specify Allis-Chalmers for rotary dryers:

- **Heavy steel, all-welded shells. Built for heavy-going service.**
- **Large bearings — long bearing life.**
- **Special 20° involute spur gear drive for long, smooth-running gear life.**
- **Built in all practical sizes, with modifications to meet requirements.**

Allis-Chalmers builds both direct and indirect dryers, for either parallel flow or counter flow operation, and combination dryer-coolers, for the effective drying and cooling of a wide variety of materials in a single operation.

The Allis-Chalmers representative in your area may be able to show you how proper drying equipment may fit into your operations profitably. A-2932

ALLIS-CHALMERS, 969A SO. 70 ST. MILWAUKEE, WIS.

ALLIS-CHALMERS

Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.

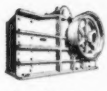
Texrope is an Allis-Chalmers trademark

IT PAYS TO SPECIFY MOTORS... CONTROLS... V-BELT DRIVES—ALL FROM ALLIS-CHALMERS

Motors — Controls

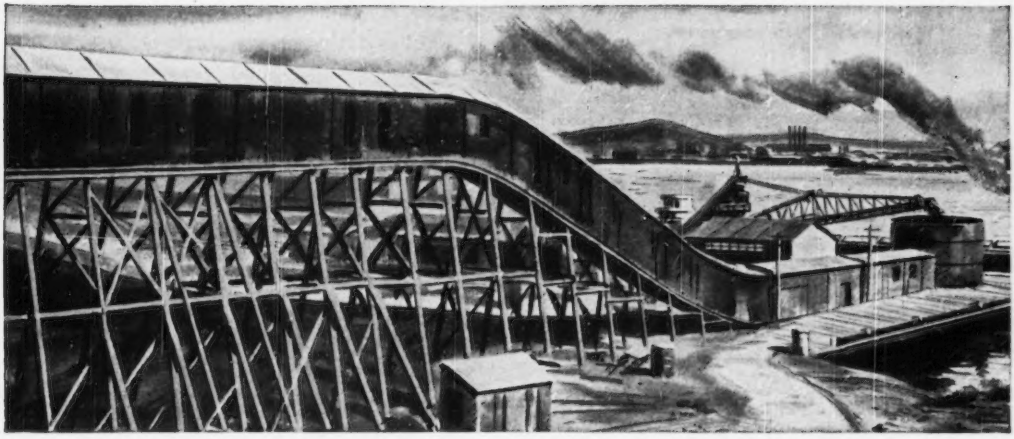
Texrope Drives

Vibrating Screens


Jaw Crushers

Kilns, Coolers, Dryers

Gyratory Crushers



Insure Longer Life For All Your Wood Construction...

Use penta-chlorophenol treated wood!

Treat not just your ties and timbers, but *all* your wood construction!

Wood that's "PENTA"-treated lasts longer . . . is safer . . . and it's an investment that pays for itself many times over in reduced maintenance costs.

PENTA leaves wood clean and easy to handle. PENTA protects wood from termites and decay and adds materially to its salvage value.

For additional information about how PENTA serves the mining industry, write Dow, Dept. PE 13.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

DOW
penta-
chlorophenol

H. H. S F SINK FLOAT PROCESS

SAVED MILLING 200,000 TONS OF WASTE IN FIVE MONTHS . .

The large pile of coarse waste shown in this photograph was rejected by the H. H. Sink Float Process before milling during only 5 months operation at a well known lead-zinc mine. For scale, note 20 ton dump truck on pile.

Ask us whether a similar saving may be made for you.

accurately controlled HEAVY DENSITY CONCENTRATION

Many millions of tons of ores have been treated by the H. H. Sink Float Process since the first commercial plant went into operation more than ten years ago.

New installations (now operating, under construction or orders) will bring the world wide capacity of H. H. Sink Float Plants to approximately nine million tons of ore annually.

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S F SINK FLOAT

MORE ECONOMICAL

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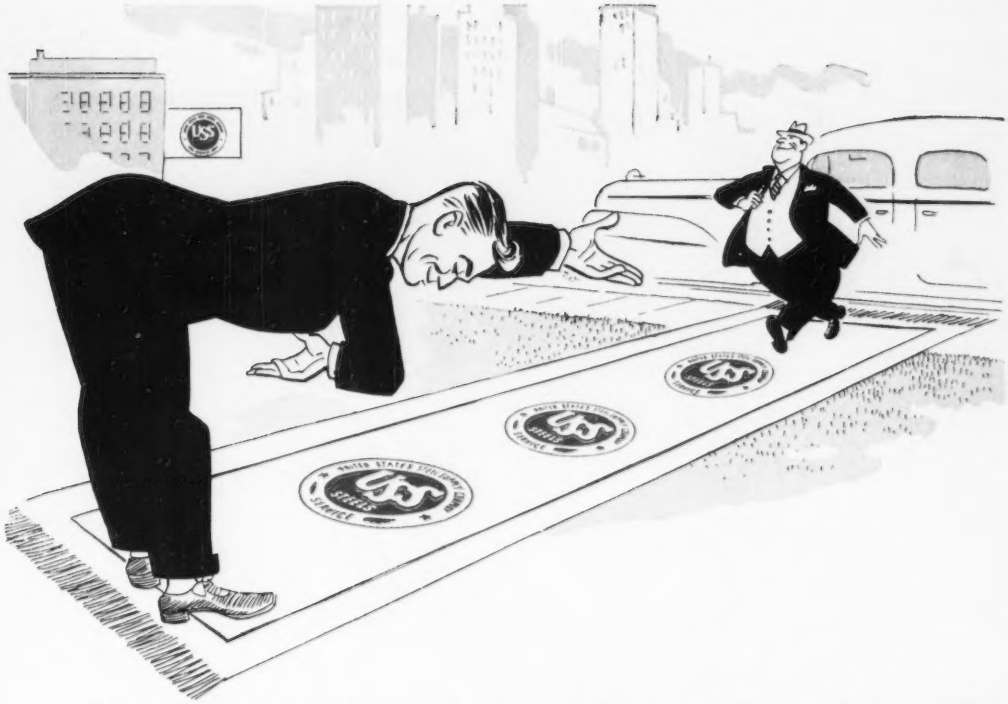
- Produces coarse market concentrate.
- Permits nonselective mining.
- Treats metallics and nonmetallics.
- Treats mine ores, dumps, fill, development ore.
- Serves existing and new installations.
- Reduces Capital and Operating Costs.

THE SINK AND FLOAT CORPORATION

EMPIRE STATE BUILDING NEW YORK 1, NEW YORK



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Service Plus is our pledge to handle your order as you want it handled. Our capacity to serve you includes a complete range of steel products, an unrivaled reputation for prompt delivery, and years of experience in providing the most complete steel service available.

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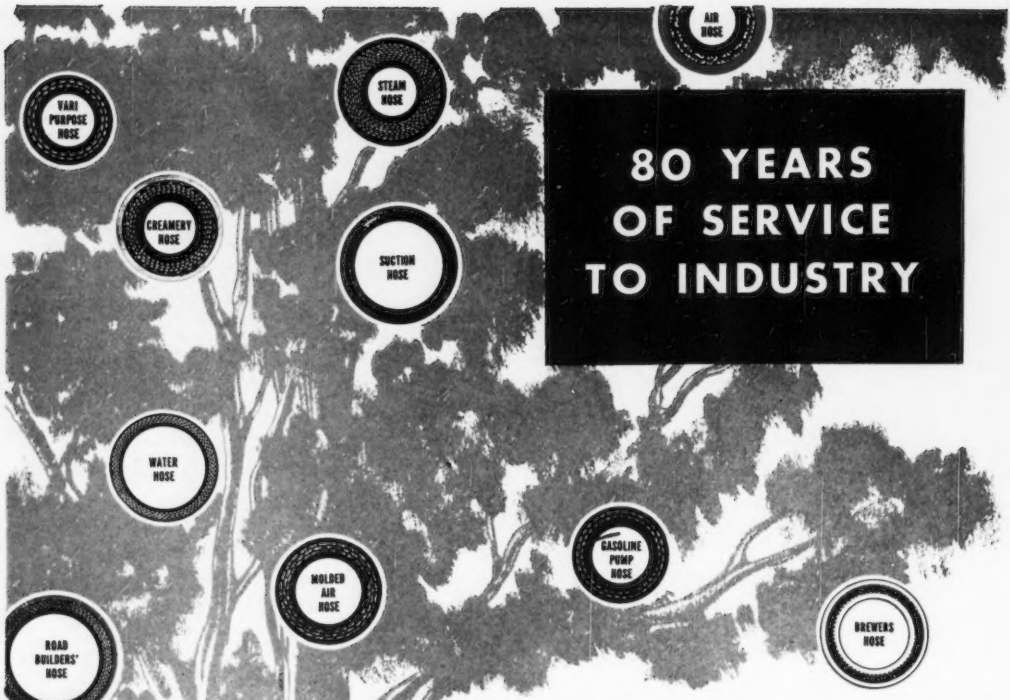
UNITED STATES STEEL



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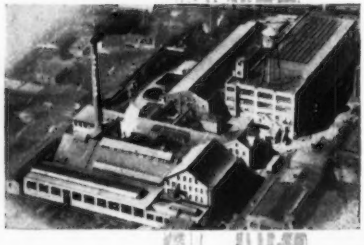
WHATEVER MAY BE YOUR REQUIREMENTS FOR BELTING, PACKING, AND HOSE, HAMILTON HAS THE PROPER TYPE. LET OUR EXPERIENCE WORK FOR YOU AND PERMIT US TO SERVE YOU WITH OUR INDUSTRIAL RUBBER GOODS.

Your inquiries will receive a prompt reply.



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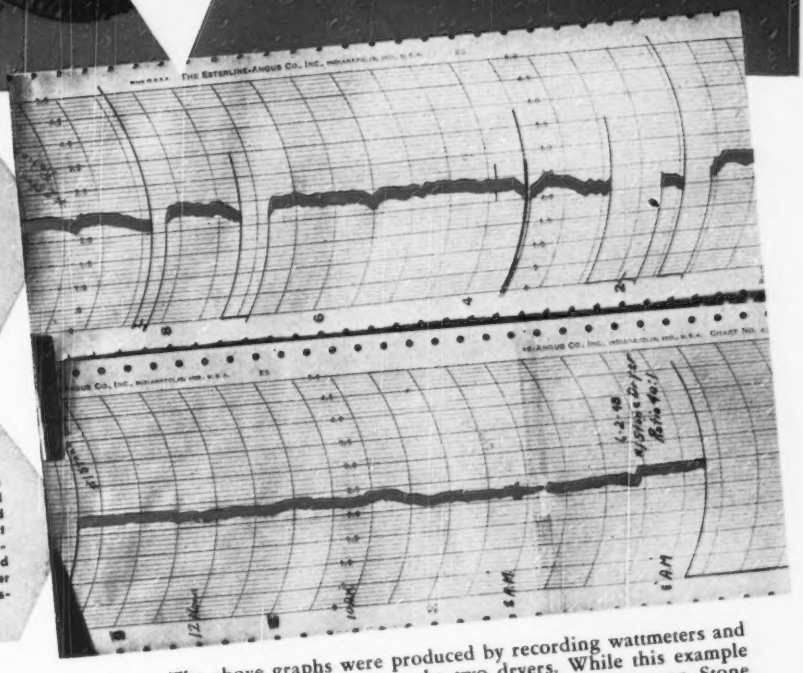
RUBBER MANUFACTURING CORP.

TRENTON 3, NEW JERSEY

CONVEYOR BELTING

Compare THESE GRAPHS !

...see how GEARS ENGINEERED BY **Stroh** INSURE CONTINUOUS, ECONOMICAL SMOOTH FLOW OF POWER



● This graph shows the costly, intermittent operation of the #2 Stone Dryer in a modern cement plant, resulting from the unsatisfactory performance of Standard 14½° Involute Cast Tooth Gearing. Are you getting this type of service from your gears?

● The gears on the #1 Stone Dryer in the same plant are of Stroh Steel 20° Involute Long and Short Addendum Cast Tooth. Note the continuity of operation and smooth flow of power these gears make possible.

The above graphs were produced by recording wattmeters and show the power input on the two dryers. While this example illustrates the superior performance of Stroh gears on Stone Dryers, they are equally as efficient on kilns—coolers—tube, rod, ball mills and all similar applications.

The smoother flow of power on the #2 Dryer resulted from the use of *Stroh Steel 20° Involute Long and Short Addendum Cast Tooth Gearing.*

Wear-resistant Stroh Alloy on the active contour of the gear teeth maintains their original contour and insures continuity of a smooth flow of power.

On receipt of your inquiry, we will gladly supply further data on your specific problem without obligation. Write today.

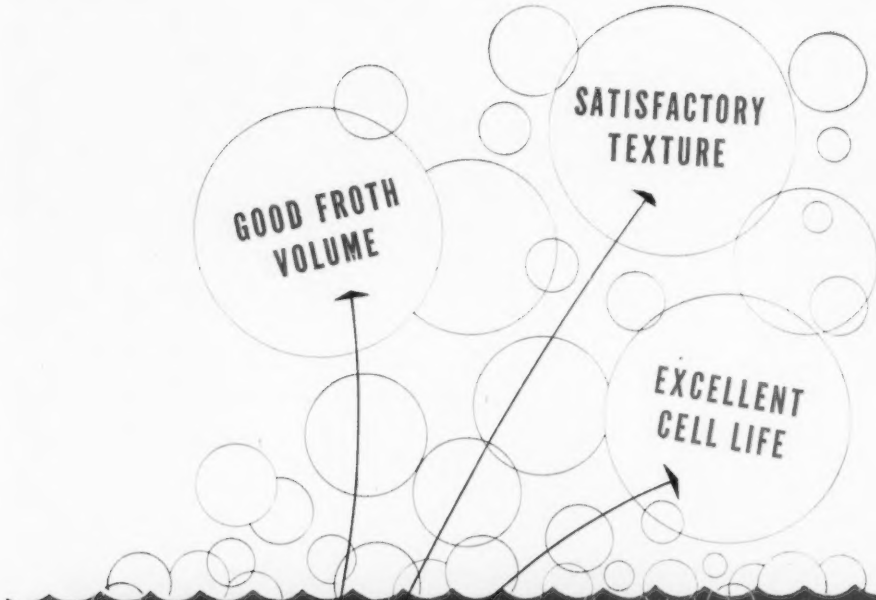
Stroh PROCESS STEEL CO.

Established 1916

PITTSBURGH 12, PENNA., U. S. A.

WALLACE YOUNG, *South American Representative*

Manufacturers of STROH ALLOY CAST TOOTH GEARS
CAST OR CUT TOOTH CARBON STEEL GEARS



Low in cost, Hercules "Yarmor" F Pine Oil is still recognized as the ideal frother for the flotation of sulphide minerals, such as zinc sulphide, copper sulphide, lead sulphide . . . and for non-sulphide minerals, such as coal, mica, quartz, graphite, feldspar, phosphate rock, talc. "Yarmor" F is especially desirable where a highly mineralized froth is required, since it can support and hold heavy concentrations of minerals until they are removed from the flotation circuit.

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STILL THE IDEAL FLOTATION FROTHER FOR

"YARMOR" F PINE OIL

SULPHIDE AND NON-SULPHIDE MINERALS

HAVE YOU TRIED THIS NEW COLLECTOR?

Hercules Rosin Amine D provides a relatively new cationic flotation reagent—an excellent collector for silica and siliceous minerals. It can be used to beneficiate many non-metallic and oxide ores, such as feldspar, phosphate rock, cement rock, and iron ore. Write for details.

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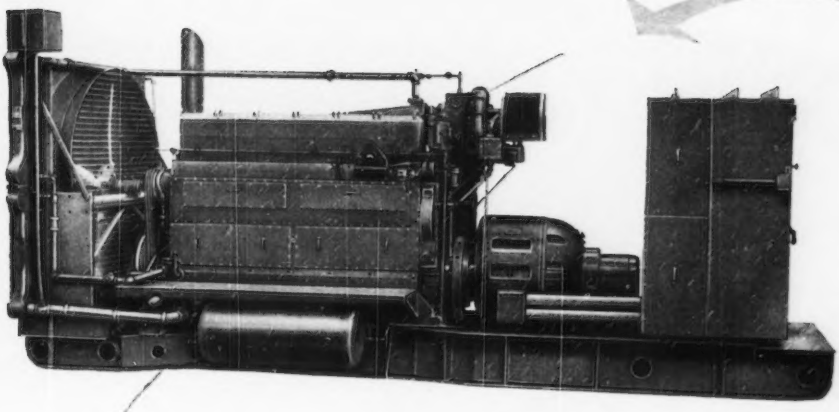
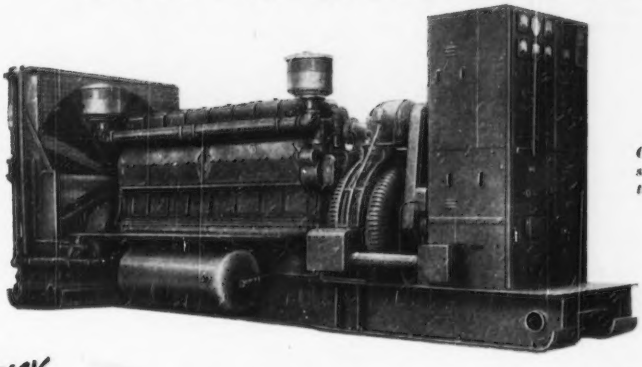


At the very spot where power is needed



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LOW FUEL CONSUMPTION results from efficient design of combustion chamber, valve mechanism and fuel injection system.

INSTANTANEOUS STARTING is assured by simple starting valve which admits air through distributor. The distributor, in turn, admits air at timed intervals to each cylinder.

DUST-TIGHT COVERS completely enclose all wearing parts, but are easily removed for inspection.

LUBRICATION is completely automatic force feed, resulting in exceptionally low maintenance.

EVERY PART is designed with ample strength for maximum rigidity with minimum weight assuring long service life.

CP PACKAGE UNITS . . . Diesel or Dual-Fuel Generator Sets . . . are another outstanding achievement of Chicago Pneumatic's thirty-four years' experience in engine building.

Designed to meet mining needs for a complete, conveniently transportable source of power for remote locations. Easily installed, instantly started, these units are readily adaptable to every power requirement.

Furnished complete with piping, wiring, and all accessories . . . ready for operation . . . they can be set up quickly and easily . . . with minimum installation expense. Write today for complete information.

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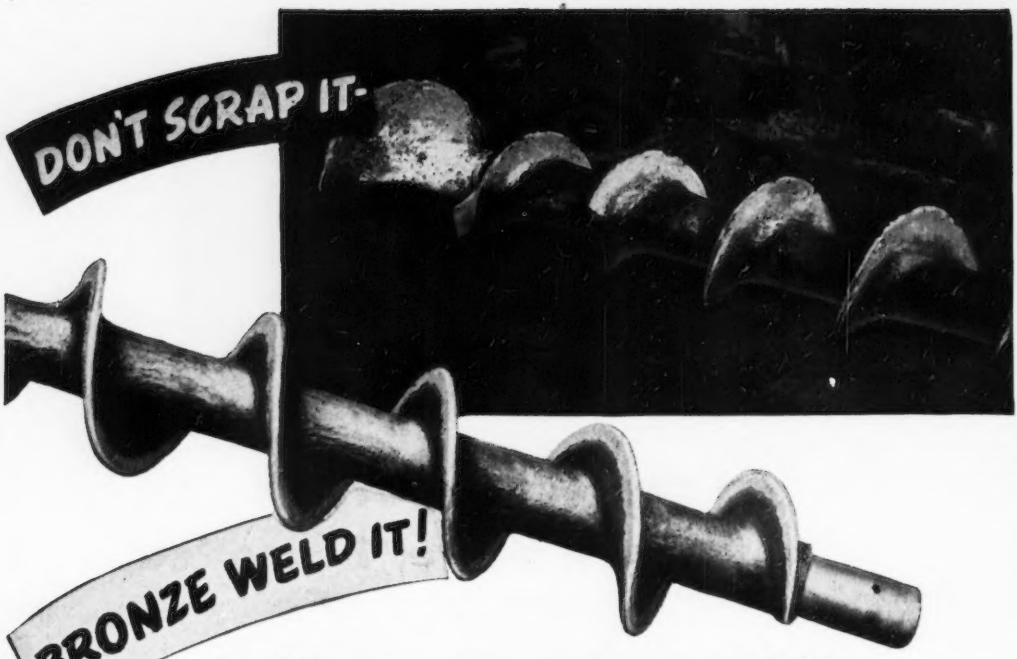

Build up worn surfaces *quickly* . . . at a fraction of replacement cost

Here's the answer to how, when and why . . .

The American Brass Company pioneered in the development of Bronze Welding and has a suitable rod for many oxy-acetylene and arc welding purposes. Anaconda Publication B-13 describes these rods and suggests procedures for their use. A copy is yours for the asking.

It's hard to imagine any kind of industrial equipment taking a worse beating than a spiral feed screw. Under tons of wet coal or in a hot ash pit, corrosive and abrasive action are ever-present. To a well known mid-western railroad shop, continual replacement because of worn outer edges proved not only too expensive but unnecessary. Bronze Surfacing was found to be fast—and far more economical.

Welding rods such as "997" Low-Fuming and Tobin Bronze* are extensively used with the oxy-acetylene torch to deposit high strength, dense and tough weld metal on cast iron, malleable iron, steel and copper alloys. By this building-up process many shops are daily saving countless dollars by reclaiming worn parts and industrial equipment:—Sheaves, pulleys, bushings and bearings, pistons, impellers and pump parts, stripped threads and broken gear teeth, thrust plates, hubs, flanges, parts machined undersize, etc.

In addition, low temperature Bronze Welding offers a ready means of repairing broken or fractured production equipment and machine tools. Next time, "Don't Scrap It—Bronze Weld It!"

*Reg. U. S. Pat. Off.

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut • Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

ANACONDA
from mine to consume

Anaconda Bronze Welding Rods

NEW RPM DELO OILS
cut engine wear-rate up to 85%

New RPM DELO Lubricating Oils contain advanced, special compounding. Proved in actual operation, they keep engines cleaner, increase protection and extend overhaul periods of all heavy-duty engines.

Cut liner wear rate up to 85%. In service under extreme operation conditions, these new RPM DELO Oils reduced wear-rates up to 85% over conventional heavy-duty type lubricants.

Reduced engine deposits as much as 75%. Superior compounding in new RPM DELO Oils kept top-ring grooves, oil rings, and skirt areas of pistons remarkably clean in high-temperature, high-output truck and tractor engines.

Saved 40% to 60% on maintenance. Records show that new RPM DELO Oils cut maintenance costs as much as 60%, reduced oil consumption 30% to 50% over the long run.

Proved in full range of engine service. This new line covers normal to extremely severe conditions. The grade that meets your needs will double protection against lubrication failures, give you all-around better engine performance.

RPM DELO Heavy Duty Lubricating Oil
A new, high quality-level compounded oil recommended for heavy-duty diesel or gasoline engines in normal to difficult service. (Meets U. S. Army Specification 2-104B.)

RPM DELO Special Lubricating Oil
Companion product to RPM DELO Heavy Duty Lubricating Oil. Has higher viscosity index for special operating conditions. (Also meets U. S. Army Specification 2-104B.)

RPM DELO Supercharged—1 Lubricating Oil
An entirely new product of higher quality-level than the products above. Fortified with new, more powerful compounding. Recommended for severe and abnormal engine service. (Meets U. S. Army Specification 2-104B, Supplemental List No. 1.)

RPM DELO Supercharged—2 Lubricating Oil
Highest quality-level oil, designed for extremely severe operating conditions. (Meets U. S. Army Specification 2-104B, Supplemental List No. 2, also the rigid requirements of Caterpillar Tractor Company's Superior Lubricants—Series 2.)

Send for the full report on new RPM DELO Oils. Actual test data furnished free. For complete information and the name of your nearest Distributor, write to any of the companies listed below.

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The California Oil Company
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Standard Oil Co. of Texas
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RPM DELO LUBRICATING OILS

New and more Efficient-Compounding keeps engines cleaner, increases protection, extends overhaul period

COST-REDUCING PERFORMANCE

Exclusive features embodied in WILFLEY Acid Pumps help you make substantial savings in the cost of handling acids, corrosives, hot liquids or mild abrasives. WILFLEY pumps are trouble-free. They operate without attention. Production records of WILFLEY installations in today's most modern chemical plants prove the cost-saving dependability of these highly efficient pumps. 10- to 2,000-G.P.M. capacities; 15- to 150-ft. heads and higher. Individual engineering on every application. Write or wire for specific information.

A Companion to the Famous WILFLEY Sand Pump

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Buy WILFLEY for Cost-Saving Performance

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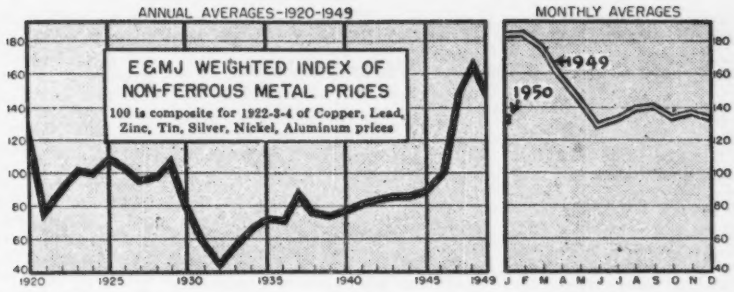
NEW YORK OFFICE: 1775 BROADWAY, NEW YORK CITY

WILFLEY *Acid* PUMPS

E&MJ OUTLOOK

PRICES



MARKETS

The sliding tin price pulled the E&MJ index of non-ferrous metal prices down another notch from December's 136.18 to 135.86 for January. **Demand for copper was excellent,** with most consumers trying to get under the wire before an expected price increase. They could be wrong. **Increased lead sales** held the price firm in the face of continuing, and large, imports. **Zinc tried nobly** to get up to 10c., but was balked by liberal offerings of the metal at the old 9¾c. basis. **The mercury cartel broke up** in Spanish-Italian disagreement, but it looks as if the separate members won't try to upset the present market, such as it is.

LABOR

Look for the CIO to drop Mine, Mill, about Feb. 15, then give its charter to Phil Murray's CIO Steelworkers Union. The Progressive Metal Council, one-time secessionists from Mine, Mill, would also land in the steel union.

The Steelworkers just wound up a strike, January 25, at New Jersey Zinc's Palmerton operations. Settlement was based on the company's present pension plan, plus a promise to bargain further on other benefits.

Mine, Mill threw in the towel at Carlsbad January 30, in the face of a growing back-to-work movement. The 2½-months'-old strike won nothing for the employees, made a potash shortage dangerously real.

Kennecott's 5c. hourly increase agreement with Mine, Mill at Utah Copper, signed January 28, could set a pattern for copper mining.

AT HOME

President Truman's **tax-message blast** at mining's depletion allowances looks like politics plus horse-trading. (See p. 126.) Knowing Congress won't easily scuttle depletion, Truman, at the Treasury's request, will play for cuts in the high depletion rates (27½%) enjoyed by oil companies. Mining's 15% rate might well wind up untouched.

Congressman Engle says he'll go all out to get S. 2105 (the O'Mahoney mine subsidy bill) through the House. It won't be long, he says. Then he looks for Senate agreement and Truman's signature.

ABROAD

U. S. Steel, announcing development of Mesabi-like tonnages of high-grade iron ore in Venezuela, also revealed purchase of land on the Delaware River near Philadelphia as a site for a future steel plant.

Reynolds Metals closed a deal with the ECA for $11,000,000 to develop Jamaican bauxite. The loan will be repaid by aluminum metal for the stockpile. ECA also signed up for a **$50,000,000 construction job** for mine plant, coal washeries, railroads, and docks in Turkey. Koppers Co. of Pittsburgh will do the job.

MARKETS—Trends and Prices

Buying Wave in Copper Continues—Zinc Returns to 9¾c. Basis—Lead Sales Improve—Straits Tin Lower

POSSIBLE SERIOUS COAL shortages, a strike at plants of the Chrysler Corp., third largest automobile manufacturer, and continued uncertainty over the outcome of labor negotiations within the non-ferrous metals industry, combined to moderate the enthusiasm over the outlook for business that was quite general as the year opened. Sales of metals, on the whole, were satisfactory.

The E&MJ index of non-ferrous metal prices for January declined slightly to 135.86, against 136.18 in December, owing chiefly to continued weakness in tin.

Copper was the most active of the major metals. Impartial observers thought that a motivating force in this commodity's activity was the persistent talk of an impending advance in the price. The basis for much of the bullish sentiment was a tightening supply situation next month, and strong indications that fabricators would continue to purchase copper at the rate of 100,000 tons or more a month in the first quarter.

Copper Sales Substantial

Sales of copper to domestic consumers for January shipment exceeded 115,000 tons, pointing to another month of above average deliveries. Imports have been maintained at a high level and domestic mine output is increasing.

Publication of the December statistics of the fabricating division of the industry late in January had a sobering influence on the market. Apparent consumption of copper in December, based on these figures, declined to 86,097 tons, from 107,965 tons in the preceding month. Producers' figures showed deliveries in December of 107,662 tons. In brief, fabricators must have increased their inventories.

The undertone of the copper market remained firm throughout the month and the price continued unchanged at 18¼c. per pound, Valley, for the third consecutive month.

Foreign demands for copper improved, owing in part to the availability of ECA funds for such purchases. An order was placed early in the month for 5,000 tons of copper for shipment to Italy. On part of this order the f.a.s. New York equivalent was lower than the going market, which accounts for our average of 18.300 f.o.b. refinery on export copper for Jan. 5.

Lead Buying Improves

Consumers came into the market for larger tonnages of lead and sellers experienced no great difficulty in maintaining the price at 12c., New York. Selling pressure from foreign sources moderated and the undertone appeared to be steady in nearly all quarters. Mine operators in this country contend that the prevailing price of lead is too low to bring out larger tonnages from domestic sources. On the other hand, foreign producers, particularly those situated in this hemisphere, will press for dollars on the sale of most of their output and continued large imports are in prospect. With the Government absorbing about 15,000 tons of lead a month for its stockpile, the flow of foreign metal into this market may not be much of a burden.

Zinc Returns to 9¾c.

As the year opened it appeared that the price would rise to 10c. per pound. All sellers but one had moved up to the higher level. However, the tonnages that were available at 9¾c. were substantial and dominated the market so far as the price structure was concerned. Our weighted daily averages reflect this condition. The threat of losing customers finally resulted in offerings at the lower level by other sellers. The move to raise the price to 10c. ended around the middle of the month. Galvanizers bought zinc freely for delivery over the next two months. Uncertainty over the coal situation began to cut into production of steel and galvanizers reduced their demands for zinc as January ended, pending further developments. Die casters hesitated because of the strike at Chrysler. Brass mills were operating on a hand-to-mouth basis in zinc.

Of particular interest to the zinc industry was the settlement of the strike at the Palmerton, Pa., smelter of New Jersey Zinc Co. The strike began Sept. 26, 1949 and continued until Jan. 25, 1950. Resumption of operations at this smelter should ease the supply situation in Special High Grade zinc, used extensively in die casting, and in zinc oxide.

The price of tin declined steadily,

E & M J Index of Non-Ferrous Metal Prices

(100 is composite for 1922-3-4)

Year			1947	1948	1949	1950
1938	73.67	January	140.88	154.20	185.52	135.86
1939	77.71	February	140.42	155.63	185.75	.....
1940	79.22	March	150.71	155.63	179.31	.....
1941	83.49	April	153.14	160.67	160.86	.....
1942	86.80	May	154.03	161.33	148.05	.....
1943	88.74	June	150.05	162.30	131.20	.....
1944	88.74	July	148.73	164.55	136.65	.....
1945	90.86	August	149.35	177.68	141.90	.....
1946	110.06	September	150.80	178.26	142.24	.....
1947	149.46	October	151.05	179.58	137.81	.....
1948	168.38	November	151.92	185.26	138.18	.....
1949	151.97	December	152.48	185.52	136.18	.....

Average Prices for January (E&MJ Quotations)

Copper:	
Electrolytic, Domestic, Refinery	18.200
Electrolytic, Export, Refinery	18.420
Lead:	
Common, New York	12.000
Common, St. Louis	11.800
Silver and Sterling Exchange:	
Silver, New York, per oz.	73.250
Silver, London, pence per oz.	64.000
Sterling Exchange, "Checks"	279.750
Zinc:	
Prime Western, East St. Louis	9.763
Tin:	
New York, Straits	76.070
New York, 99% min.	(e) 75.070
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$71.000
Antimony, (E&MJ) (d)	33.200
Antimony, bulk, Laredo	29.920
Antimony, in cases, Laredo	30.420
Platinum, refined, per oz.	$69.000
Cadmium, (a)	200.000
Cadmium (b)	207.500
Cadmium (c)	215.000
Aluminum, 99% plus, ingot	17.000
Magnesium, ingot	20.500
Nickel (f)	40.000

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange, checks, in cents. Quicksilver, per flask of 76 lb.

(a) Cadmium average based on the producers' quotation.

(b) Cadmium average based on the average of the producers' and platers' quotation.

(c) Cadmium average based on platers' quotation.

(d) Domestic, 5 tons or more but less than carload lot packed in cases, f.o.b. New York.

(e) Tin contained.

(f) F. o. b. Port Colborne, U. S. duty included.

narrowing the spread that existed early in the period between spot and the forward positions. Though the United States authorities purchased some tin for the stockpile, the lack of buying interest by consumers forced the price down to 74½c. per pound on Straits quality metal, a net loss for the month of 3c.

The International Tin Study Group is scheduled to meet in Paris on March 20 to review the supply situation and discuss the plan to revive an international control agreement.

Production of primary aluminum in the United States in November was 35,865 tons, against 45,790 tons a month previous. The strike at two reduction plants of the Aluminum Company of America accounted for the drop in output.

Mercurio Europeo, the Spanish-Italian quicksilver combine that has been in existence since Oct. 1, 1928, has been dissolved as of Jan. 1, 1950. The Spanish interests have been dissatisfied with the wide open market in the metal that has diverted much of the business to other producers.

Antimony fell 3¼c. per pound, establishing the quotation named by National Lead Co. on its 99½% grade at 28¾c. per pound, in bulk, carload lots, f.o.b. Laredo, Texas. The New York market on this grade boxed, in lots of 5 tons or more but less than a carload, was established at 32.030c. per pound.

Cleveland-Cliffs Iron Co. announced a 50c. per ton advance in Lake Superior iron ore.

(Continued on page 125)

Major Metals

U. S. DAILY AND AVERAGE PRICES

Jan. 1950	Electrolytic (a) Domestic	Copper (b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis
2	Holiday	Holiday	Holiday	Holiday	Holiday	Holiday
3	18.200	18.425	77.500	12.000	11.800	9.785
4	18.200	18.425	77.500	12.000	11.800	9.775
5	18.200	18.300	77.500	12.000	11.800	9.780
6	18.200	18.425	77.500	12.000	11.800	9.760
7	No Market	18.425	77.500	12.000	11.800	9.750
9	18.200	18.425	77.000	12.000	11.800	9.765
10	18.200	18.425	77.000	12.000	11.800	9.820
11	18.200	18.425	77.000	12.000	11.800	9.800
12	18.200	18.425	77.000	12.000	11.800	9.800
13	18.200	18.425	76.250	12.000	11.800	9.775
14	No Market	18.425	76.250	12.000	11.800	9.750
16	18.200	18.425	76.250	12.000	11.800	9.755
17	18.200	18.425	76.250	12.000	11.800	9.755
18	18.200	18.425	76.250	12.000	11.800	9.750
19	18.200	18.425	75.500	12.000	11.800	9.750
20	18.200	18.425	75.500	12.000	11.800	9.760
21	No Market	18.425	75.500	12.000	11.800	9.750
23	18.200	18.425	75.250	12.000	11.800	9.750
24	18.200	18.425	75.250	12.000	11.800	9.750
25	18.200	18.425	75.000	12.000	11.800	9.740
26	18.200	18.425	75.000	12.000	11.800	9.750
27	18.200	18.425	74.500	12.000	11.800	9.750
28	No Market	18.425	74.500	12.000	11.800	9.750
30	18.200	18.425	74.500	12.000	11.800	9.750
31	18.200	18.425	74.500	12.000	11.800	9.750
			AVERAGES FOR MONTH			
Jan.	18.200	18.420	76.070	12.000	11.800	9.768
			AVERAGES FOR WEEK			
Jan.						
4	18.200	18.425	77.500	12.000	11.800	9.780
11	18.200	18.404	77.250	12.000	11.800	9.779
18	18.200	18.425	76.375	12.000	11.800	9.764
25	18.200	18.425	75.333	12.000	11.800	9.752
			CALENDAR WEEK AVERAGES			
Jan.						
7	18.200	18.400	77.500	12.000	11.800	9.770
14	18.200	18.425	76.750	12.000	11.800	9.785
21	18.200	18.425	76.875	12.000	11.800	9.753
28	18.200	18.425	74.917	12.000	11.800	9.750

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West command a premium of 1.10c. per pound over the current market for the Prime Western; Special High Grade 1.25c.

Quotations for lead are for common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and one-eighth cent fractions per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance for carrying, delivering, and marketing. In addition to foreign silver, the quotations also apply to domestic and Treasury silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Jan. 1950	Sterling Exchange "Checks"	Silver (c) New York	Silver (c) London	Gold London	Gold (d) United States
2	Holiday	Holiday	Holiday	Holiday	Holiday
3	279.750	73.250	64d.	248s.	$35.00
4	279.750	73.250	64d.	248s.	35.00
5	279.750	73.250	64d.	248s.	35.00
6	279.750	73.250	64d.	248s.	35.00
7	(e)	(e)	(e)	(e)	35.00
9	279.750	73.250	64d.	248s.	35.00
10	279.750	73.250	64d.	248s.	35.00
11	279.750	73.250	64d.	248s.	35.00
12	279.750	73.250	64d.	248s.	35.00
13	279.750	73.250	64d.	248s.	35.00
14	(e)	(e)	(e)	(e)	35.00
16	279.750	73.250	64d.	248s.	35.00
17	279.750	73.250	64d.	248s.	35.00
18	279.750	73.250	64d.	248s.	35.00
19	279.750	73.250	64d.	248s.	35.00
20	279.750	73.250	64d.	248s.	35.00
21	(e)	(e)	(e)	(e)	35.00
23	279.750	73.250	64d.	248s.	35.00
24	279.750	73.250	64d.	248s.	35.00
25	279.750	73.250	64d.	248s.	35.00
26	279.750	73.250	64d.	248s.	35.00
27	279.750	73.250	64d.	248s.	35.00
28	(e)	(e)	(e)	(e)	35.00
30	279.750	73.250	64d.	248s.	35.00
31	279.750	73.250	64d.	248s.	35.00
		MONTHLY AVERAGES			
Jan.	279.750	73.250	64d.	—	35.00
		AVERAGES FOR WEEK			
Jan.					
4	279.750	73.250	—	—	—
11	279.750	73.250	—	—	—
18	279.750	73.250	—	—	—
25	279.750	73.250	—	—	—

Calendar week averages; New York Silver: Jan. 7th, 73.250; 14th, 73.250; 21st, 73.250; 28th, 73.250.

(e) No market (Saturday).

Behind the By-Lines...

G. P. Lutjen

1931—The dull thud was metal prices hitting bottom.

1943—OPA ceilings didn't help in the long climb back.

1947—Going up and happy days were here again.

» **Like Christmas, Thanksgiving** and the **World Series,** this business of "survey and outlook" happens once a year. We stop blazing away just long enough to count the bulls eyes in the target, and then reset our sights for the next round.

The "survey and outlook" cover is almost a story in itself, from the "Brother-can-you-spare-a-dime" era to the more recent 50c. cigar days. The present situation is not all beer and pretzels by any means but it's a lot easier to take than the days of 3c. lead when prosperity was just around the corner. A look at the cover chart would almost lead one to quote that popular and obnoxious phrase of World War II vintage, "Mac, you never had it so good."

But like all charts (even ours) you have to look twice to make sure that no one is trying to put something over on you. Take this one for instance. We were highly indignant when we noted that while OPA clamped the lid on metal prices, the general industrial index zoomed to a figure best described as astronomical. But before we could utter the second syllable of "Aha!" someone pointed out that subsidies and premium prices made up for a good bit of the difference. There's an answer for that too, but that's another story.

So much for the cover: inside the book are the highlights of the year's progress and some honest, intelligent guesses on the future, made by men who are in the best position to judge. The batting order is loaded with power. It would be unfair to select any particular ones as stars of the team, so we'll just submit the following samples taken at random.

» **Again this year,** the light metals are taken apart and put together by **Richard J. Lund** of the Battelle Memorial Institute (p. 90). How he finds time to turn out this article with such a heavy schedule is a source of minor amazement. If your fate is linked in any way with aluminum or magnesium, you surely won't bypass this item.

» **Another return engagement** is that of **Charles R. Ince,** vice president and general sales manager of **St. Joseph Lead Co.** In his capacity with "a leading producer", Mr. Ince is on familiar terms with zinc problems from mine to the consumer. Review and forecast for the zinc situation (p. 87) couldn't be in better hands.

» **For an up-to-the-minute** (and we use the term literally) **picture** of what's going on underground today, you can stack your chips on the "Survey of Mining Practice" (p. 108). Just for the record, this is no recapitulation of the technical literature which appeared in 1949, which in turn, probably dealt with 1948 developments. This survey is based on reports from 160 large mining companies and over 100 manufacturers contacted by the "surveyor."

A quick glance reveals that drilling stole the limelight last year, but you'll find reference to everyone of the year's important developments in the fine art of getting rock out from under.

» **In this 81st review number** we are carrying over into the non-metallics the practice of having each mineral discussed by a man whose perspective of the industry includes profit and loss statements. Any statistics that pop up are assayed according to how they will affect consumer or producer in the times ahead. The non-metallics department tees off on page 100.

» **We have long contended** that mining men are the hardiest of citizens. Neither low-grade ore, nor foreign metal, nor Deals, New and Fair, nor monumental taxes can do them in. We can't make up our mind whether they are really tough or just stubborn. At any rate we hereby submit this letter to support our stand on the indestructibleness of people in the mining industry.

". . . I own Gold, Silver and Uranium properties there (Mexico) and know Mexico from 1870. I am in my 95th year and my taxes are all paid up in Mexico and I have all the documents to that effect to February and June next 1950. This currency wake-up on the part of Mexico will give me new courage to put in up to date mine mill and smelter on the spot."

J. Albert Harle
Los Angeles, California

Good luck with the new plant, Mr. Harle.

ENGINEERING AND MINING JOURNAL

FEBRUARY, 1950

Mining Must Expand

THIS MODERN WORLD, with its rapid changes and mixture of political with economic affairs, is often confusing. Thus, after the ups and downs of 1949, we are sure readers will take a particular interest in this annual review and outlook number. The record of recent events and the authoritative opinions of the contributors to this issue are important to an understanding of things to come. However, as we weigh the problems of the day, it is valuable to keep our mental balance, to appreciate our fundamental strength as well as to concern ourselves with matters of greatest current interest. Only in this way can we face the future with a proper perspective.

We were looking at year-end business summary and forecast the other day and it was remarkable to note how the writers of various articles insisted on being gloomy, almost reluctant to admit that 1950 looks like a good business year. Those features of recent history which were frightening or depressing were left to stand on their own, but every optimistic note pertaining to the outlook was carefully hedged with qualifications.

One can pay so much attention to doctors that he views all people as patients, not reasonably normal human beings who manage somehow to plug along. Listening to these professional economic analysts who are constantly probing the national economy for signs of weakness, the business community has developed such a chronic state of fear that good news is upsetting.

The plain, obvious fact is that the nation's economy, which is nothing but the sum of all our work and needs, is much more distinguished by its durability than by its ills. Even during the worst depression in several generations, most economic functions carried through. We spend much of our time worrying over fringe issues, and the worry itself becomes so pervasive that it becomes an economic reality, a cause of reduced orders and unemployment, in its own right.

Is the domestic mining industry similarly disposed to be so preoccupied with fringe troubles that it no longer appreciates its strong, healthy fundamental structure, and almost enjoys being sorry for itself? Why in a period of very lively demand and of prices higher than we dared during the war to hope would prevail, are we so beset with apprehensiveness and gloomy foreboding?

Some of us are so upset by tonnages of unexpected foreign lead or zinc entering our markets from dollar-hungry countries that we seem to forget that we enjoy a market which is the envy of all the world, a still growing one so large that domestic production can no longer satisfy it. Let's not overlook in viewing fringe issues, that the United States mining industry is by far the largest and strongest in the world, that we enjoy use of the most highly mineralized area on the globe, and that the weight of our industry in all except strategic minerals is such in the world picture that our costs largely determine world prices. The next time you see one of these crepe-hangers who predicts the destruction of American mining, ask him how the world is going to meet its great and growing needs for minerals without a large segment continuing to come from the United States. The real problem facing the world of the future is not oversupply, but how it is going to satisfy the demands for minerals implicit in the standards of living toward which all countries are dedicating themselves. Per-capita needs are still mounting, population is increasing, and people are learning more and more to treasure a supply of essential raw materials.

This is not to say that we do not have real problems. The effect of burdensome taxation in drying up venture capital is a real threat to a private-enterprise, i.e., an efficient, industry. The decline of small mining, largely due to the same cause, is a problem of mutual concern to all. The maintenance for security purposes of an industry which can be an effective bulwark to national defense is important. The continued exploitation of much of mine labor by Communist-inspired leaders is a serious menace.

But acknowledging these troubles and addressing ourselves to their cure let us not forget that although there may be many substitutions of one mineral for another the mining industry will carry on. The world is not going back to living in tents. Whether under socialism or capitalism, with its growing population and aspirations toward better living, it is bound to make increasing demands on the mining industry.

Steady Demand Ahead As Mining Enters 1950

With business activity forecast at near-1949 levels, mining should have a good year. Demand for metals and minerals seems steadier; speculation is declining. Government stockpile policy chief uncertainty

THE YEAR 1950 HAS OPENED with an optimistic appraisal of the economic future from the head of the State—President Truman. Within five years he envisions the possibility of a national income of $300,000,000,000—an advance of 33% over the present rate and of $1,000 in the average income for each family in the country.

These are laudable aims with which no one can quarrel. But though the goal may be universally acclaimed, it does not follow that there is agreement on the methods by which it may be achieved. That it can be reached, if Congress and the Administration are prepared to mortgage the future without reckoning the eventual cost, there is little doubt. Unbalance the budget, bolster every basic commodity with subsidy support at sufficiently high levels, augment foreign aid and government capital investment on an enlarged scale, and the resulting inflation will doubtless make a $300,000,000,000 yearly national income a reality overnight. After all, the figures of national income in Germany in 1923-24 and of China in 1947-48 in terms of their national currencies ran far into the trillions and quadrillions.

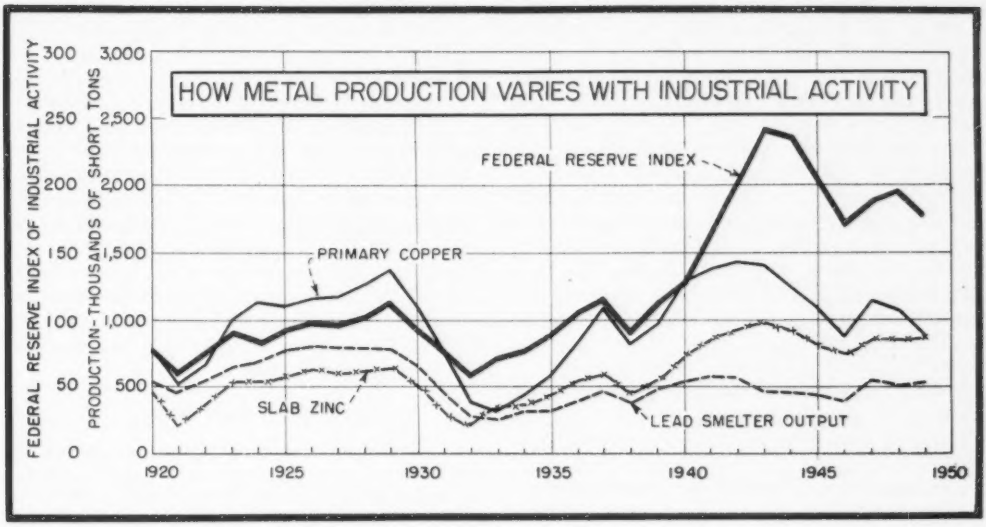
Population Growth Responsible

Mr. Truman's optimism, and that of many of the economic prophets, is based in large degree on our rapidly-growing population. During the decade of the Forties this country has added 18,000,000 citizens to its rosters—a rise of 15%. This is more people than in all Canada or all of Argentina or all of Scandinavia. Our living standards are higher than those of any of these prosperous areas. One has merely to look at the impressive capital plant—the railroads, factories, retail establishments, power plants, public buildings, highways, dwellings, farms, etc.—of any of these nations and imagine duplicating it entirely within ten years to get some picture of the long-term job that our population growth is forcing upon us.

In this glowing estimate of what more people mean to our economic health, however, it is often overlooked that there was a substantial growth in population during the Thirties, too. Admittedly not as great as in the Forties—a mere 11,000,000 against 18,000,000—it was, nevertheless, an increase of almost 10%. In terms of other nations it was equivalent to Belgium plus Switzerland; or Australia plus two New Zealands.

And yet during the Thirties we did not have prosperous times; capital investment was at a minimum level; housing lagged; prices were down; only at the end of the decade, when war approached, did the economic indices begin to rise to approximations of the levels attained in the prosperous Twenties. The extra 11,000,000 people did not automatically cause a corresponding increase in productivity; they simply shared in the already existing level and, therefore, the average individual share—the average standard of living—declined.

There is room for disagreement as to why production did not increase in the Thirties, but it is well to remember that it did not increase. One cannot assume, therefore, that a rising population inevitably brings in its wake a period of economic prosperity. If the present record-breaking increase in the numbers of our people



is to bring a real gain in the standard of living—and not a fictional breaking of records in terms of a dollar of dwindling value—then government, industry, and labor must work together to increase production. Production must increase by one-third, not just dollar incomes.

So far as the mining industry within the United States is concerned, it cannot be said that any such major increase as 33% within a five-year period is in prospect. With the exception of a few minor metals in the strategic group—notably mercury, tungsten, and manganese—production in the post-war period has been maintained at or close to the record levels of the war years. Capital investment has been large, but it has been for the purpose of improving extraction, reducing costs (or mitigating the effects of rising wage levels), and relocating plant in more suitable geographic conformation to markets and raw materials. Actual increases in capacity have been fairly well confined to the steel industry. Even the rapidly growing aluminum industry has been building new plants to replace obsolescent units and not to expand its maximum potential.

In the copper industry there is one major new project, the San Manuel, which may eventually increase capacity, but it will at best only begin producing at the end of the period of which the President speaks.

It is this well recognized fact that the mining industry of this country has, for the time being at least, reached a plateau level of productivity that accounts for the continued interest in subsidy legislation. In 1949 the Administration and the Congress appeared to move closer together in their views on this controversial issue. During the closing days of the first session of the 81st Congress there seemed to be agreement that outright subsidies of production were undesirable or, at least, should be deferred. The field of government assistance was narrowed down to aid for exploration and aid for maintenance of well-defined reserves contained in marginal operating mines. Bill No. S2105, embodying these principles, came close to enactment and is expected to be pushed vigorously early in this session.

Industry Is Wary

A large portion of the industry, wary of the opening wedge of government participation, is still convinced it neither wants nor needs this type of help. The bill, as written, leaves enormous discretion in the hands of the administrators; their regulations, coupled with a generous appropriation, could—it is maintained—still permit the government to decide for the entire industry such basic matters as prices and profit margins. These opponents of S2105 argue that tax reform (not to be confused with tax reduction) is what is principally needed to encourage private capital to venture on bold exploration programs of its own, without government assistance, as is the case in Canada under a liberal tax structure.

Whatever the merits of this argument, the political chances seem now to favor those who back S2105. However, the unbalanced budget and the public's growing opposition to the present tax burden indicate that only limited funds may be available to carry out the purposes of the act. Furthermore, it will take time to establish the

administrative machinery. Thus while 1950 may, in retrospect, mark the beginning of a new industry-government relationship in mining, it is unlikely that at the end of the year we will have much concrete evidence as to the results of such altered relationship.

The year 1949 saw the first marked economic reversals for the mining industry following the inflationary trends of the war and the immediate post-war years. In previous annual surveys reference was made to the probability that we had to face the equivalent of the 1921-22 era. Was 1949 that adjustment? While prices of copper, lead, zinc and tin dropped sharply; while consumption of all of these metals, and of aluminum also, was somewhat less than in the years immediately preceding; and while some closing of mines resulted from the lower prices, on the whole the industry did not suffer anything like the economic reversal of the 1921-22 years, when the bulk of the mining industry had to suspend production and the financial position of many of the leading companies seemed precarious. Was 1949, therefore, the forerunner of a still more serious recession in activity of the mining industry? It does not seem so.

The economic prophets are remarkably unanimous in seeing a year of good business in 1950 for the U. S. as a whole. The general anticipation is that industrial production, which averaged about 175 in 1949, as against 192 in 1948, will probably be at approximately the same level in 1950 as in 1949, however, without the wide swings which characterized last year.

Capital Investment Down

A somewhat lower level of capital investment in new plant facilities is indicated, but both the automobile and the residential construction industries are looking forward to a high rate of activity. Public purchasing power is expected to remain high and will undoubtedly receive some stimulus from the distribution of veterans' insurance dividends.

Although short-term trends in many of the non-ferrous metals frequently appear to be in opposition to the trend of business as a whole, over any such period of time as a full year experience has shown that the level of activity in metals will correspond fairly closely to that for all business (as the chart indicates). It would seem that inventories of consuming industries generally are now at a normal level. In 1948, when shortages were feared, they undoubtedly were excessive. In 1949, when surpluses were feared, they were cut to the bone. Assuming that today purchasing agents must cover actual requirements, the tone of the metal market should be considerably steadier in 1950 than in 1949.

It is obviously to the interests of the mining industry to eliminate spurts in buying activity, which are followed by periods of little or no buying, since this can only lead to wide fluctuations in metal prices that complicate the operating man's problem and probably in the long run result in some loss of ore reserves.

Unduly high prices or unduly low prices for metal provide an incentive to the consumer to speculate, rather than to purchase against actual needs. While the prices that prevailed at the end of 1949 look high in relation to the prewar levels, they are not high in relation to present production costs, and consumers should, therefore, have every encouragement to buy their lead requirements in a normal fashion.

Stockpile Big Factor

One important factor in the metal picture in the United States in 1949 was the government's stockpiling program. The funds voted by the first session of the 81st Congress for the fiscal year 1949-50 were the largest for any fiscal year to date, and more progress has been made in the last twelve months in accumulating the stockpiles than in any previous year since the program started. Bearing in mind the public demand for reduced taxes and reduced government expenditures, Congress may well decide that the stockpile program is far enough along the road to completion. If so, all of the funds requested by the President for the 1950-51 fiscal year may not be provided. Nevertheless, one may reasonably expect the program to continue during 1950 at a substantial rate. However, the mining industry will do well to prepare itself for the probability that in another year or two stockpile buying may be decidedly on the wane.

In another field of government activity, namely, foreign assistance, it is certain that funds available will be smaller during the current year than they have been in 1949. While the United States itself is no longer an exporter of non-ferrous metals originating in this country, the mining industry of the balance of the Western Hemisphere still leans fairly heavily on markets in Western Europe. The recovery which has taken place in industrial activity in Western Europe has also been accompanied by some increase in metal production available for sale in so-called "soft currencies." This means a reduced demand for the products of the mines in Chile, Canada, Mexico, and the other countries of the Western Hemisphere.

Therefore, even if business in the U. S. should exceed current expectations and consumption should actually run well ahead of 1949, the possibility of a recurrence of the shortages which existed in 1947 and 1948 seems fairly remote.

Industry's 1950 Investment Plans

INDUSTRY, IN GENERAL, plans to invest $12.4 billion in new plants and equipment in 1950. This is only 13% less than it actually spent for this purpose in 1949.

Mining, as the chief supplier of raw materials for this construction job, is vitally concerned with figures such as those shown below. They presage a year of steady demand and good prices for mining's products.

These data form part of the third annual survey of industry's plans to invest in new plant, made by the McGraw-Hill economics staff.

How 1950 Planned Capital Expenditures Compare With 1949 Expenditures

	1949 Expenditures	1950 Planned Expenditures	Percent Change
	(Millions of Dollars)		
Steel	$ 520	$ 445	—14
Chemicals	1,100	1,040	— 5
Petroleum Refining	700	580	—17
Machinery	530	460	—13
Electrical Machinery	200	135	—32
Autos	420	550	+31
Textiles	410	360	—12
Transportation Equip.	145	95	—34
Food	600	585	— 3
Other Manufacturing	2,575	2,050	—20
Total Manufacturing	7,200	6,300	—13
Railroads	1,310	735	—44
Electric Utilities*	2,220	2,180	— 2
Gas Utilities**	940	870	— 7
Other Transportation and Communications	1,880	1,695	—10
Mining	750	620	—17
All Industry GRAND TOTAL	$14,300	$12,400	—13

Electrical World Survey. **American Gas Association Survey.

How Industry Plans to Finance 1950 Capital Expenditures

	Percent of Expenditures to be Financed From:			
	Depreciation and Retained Profits	Sale of Stock	Bonds, Bank Loans, or Other Debt	Other
All Manufacturing	92%	0.4%	6%	1.6%
Autos	100	0	0	0
Chemicals	97	3	0	0
Electrical Machinery	99	0	1	0
Machinery	85	0	12	3
Petroleum	96	0	2	2
Steel	88	0	12	0
Transportation Equip.	100	0	0	0
Food	81	0	19	0
Textiles	94	0	6	0
Other Manufacturing	90	0	6	4
Railroads	68	0	32	0
Mining	85	0	9	6

Note that industry plans to finance new investment out of its own resources. Almost no one plans new stock issues. This is partly because industry has the money, partly shortage of venture capital.

How Actual Capital Expenditures, in 1949, Compare With Plans Reported a Year Ago

	1949	% 1949 Actual of Planned
	(Millions of Dollars)	
Textiles	$ 410	100%
Autos	420	74
Chemicals	1,100	90
Food	600	114
Electrical Machinery	200	91
Machinery	530	82
Petroleum Refining	700	97
Steel	520	87
Transportation Equipment	145	88
Misc. Mfg.	2,575	118
Total Manufacturing	7,200	100
Railroads	1,310	86
Other Trans. & Commun.	1,880	106
Mining	750	99
Electric Utilities	2,220	108
Gas Utilities	940	115
All Industry Grand Total	$14,300	101%

How Present Plans for 1950 Capital Expenditures Compare With Plans Laid a Year Ago

	1950	% Present 1950 Plans of a Year Ago
	(Millions of Dollars)	
Textiles	$ 360	n.a.
Autos	550	108%
Chemicals	1,040	79
Food	585	109
Electrical Machinery	135	84
Machinery	460	74
Petroleum Refining	580	85
Steel	445	91
Transportation Equipment	95	73
Misc. Mfg.	2,050	136
Total Manufacturing	6,300	101
Railroads	735	74
Other Trans. & Commun.	1,695	111
Mining	620	84
Electric Utilities	2,180	119
Gas Utilities	870	131
All Industry Grand Total	$12,400	104%

n.a. Not available.

Planned Capacity Increases and Sales Expectations for Manufacturing Industries

	Planned Increase in Capacity in 1950 (Percent)	How 1950 Sales Are Expected to Compare With 1949 (Percent)
All Manufacturing	3%	— .4%
Autos	1	+2
Chemicals	8	+4
Food	4	+1
Electrical Machinery	1	Same
Machinery	3	—2
Petroleum Refining	3	+2
Steel	1	—2
Textiles	6	+1
Other Manufacturing	2	—3

Note three things here: 1, industry's performance was slightly better than its plans in 1949; 2, plans for 1950 are holding up well; 3, all industry plans increased capacity and looks for almost equal sales in 1950.

Metals IN REVIEW

Gold

Currency devaluation increases gold mine profits outside the USA. Free market premiums decline. Flow of gold to this country slackens markedly.

M. A. KRIZ, New York, N. Y.[1]

VIEWED IN THE PERSPECTIVE of the postwar years, gold developments during 1949 were neither spectacular nor dramatic. Yet, the long-run position of gold was greatly affected last year in three main respects:

1. After a moderate expansion in each of the early postwar years, gold output in 1949 increased by 1 million fine ounces. Devaluation of sterling and thirty other currencies in 1949 brought about a rise in the price of gold in terms of the devalued currencies. Although this rise was only incidental to the currency adjustments, it greatly improved the position of gold mining in the devaluing countries, which account for about 80% of world gold output outside the Soviet Union. In consequence, trends in world gold production may change greatly in the coming years, although the long-run effects of devaluation are otherwise hardly discernible as yet.

2. Markets for semi-processed gold were extended in 1949, and in some countries restrictions on private gold dealings were abolished. These changes were confined to the fringe of world supply and demand for gold. What, however, may prove significant in the long run is the fact that prices on world premium markets last year showed a declining trend.

3. As to international gold transactions between the monetary authorities, a moderate redistribution of gold occurred last year. United States monetary stocks, which had greatly increased in 1947 and 1948, last year rose only a little. Conversely, whereas in 1947 all foreign countries with two exceptions were losers of gold and in 1948 only a very few added to their holdings, quite a number began to build up their gold reserves gradually in 1949.

Gold output of the principal producing countries other than the Soviet Union, as given in Table I, was 23.8 million ounces last year, approximately 1 million fine ounces higher than in 1948. The postwar rise in output that began in 1946 seems thus to have continued in 1949. Last year's production was 2.6 million higher than in 1945, the postwar low, but was 12.9 million lower than in 1940, which was a year of record output.

South African output remained stationary last year at some 11.7 million fine ounces, as against 11.6 million in 1948—the first year since 1941 in which production had increased. The industry, after the September rise in price, required time to adjust its milling policy and costs.

Last year's output does not seem to have been affected by the wave of currency devaluations in September, 1949. Yet, countries with devalued currencies produce some 80% of the world gold output (excluding the U. S. S. R.), and although the devaluations aimed primarily at correcting the overvaluation of foreign currencies in terms of the United States dollar, one incidental result was the rise in the price of gold by 10% in Canada, 14% in the Belgian Congo, and 44% in the Union of South Africa and other sterling area countries. The profitability of gold mining has thus been increased, but this objective does not seem to have weighed much, if anything in the ultimate decision to devalue.

In reviewing gold output in a year of world-wide devaluation, one is confronted with the question whether the experience of the Thirties can throw some light on the

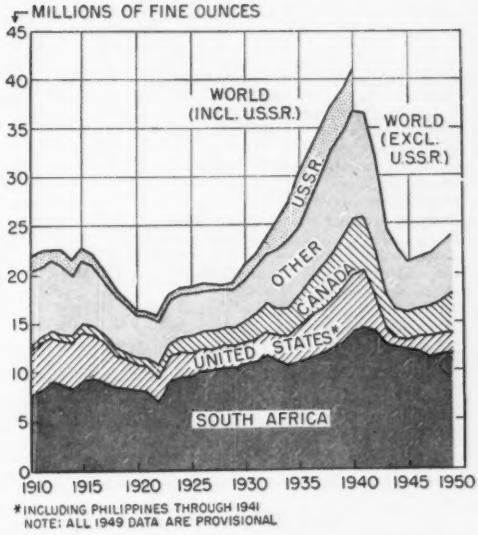
[1]The author is on the staff of the Federal Reserve Bank of New York. The views he expresses are not necessarily those of the Bank.

Table I. World Gold Production

(In millions of fine ounces)

	1949[1]	1948	1947	1946	1940
North America					
Canada	4.1	3.5	3.1	2.8	5.3
United States	2.0	2.0	2.2	1.5	4.9
Central and South America					
Mexico	0.4	0.4	0.5	0.4	0.9
Colombia	0.4	0.3	0.4	0.4	0.6
Chile	0.2	0.2	0.2	0.2	0.3
Nicaragua	0.2	0.2	0.2	0.2	0.2
Africa					
Union of South Africa	11.7	11.6	11.2	11.9	14.0
Gold Coast	0.7	0.7	0.6	0.6	0.9
Southern Rhodesia	0.5	0.5	0.5	0.5	0.8
Belgian Congo	0.4	0.3	0.3	0.3	0.6
Asia					
India	0.2	0.2	0.2	0.1	0.3
Philippines	0.3	0.2	0.1	[2]	1.1
Oceania					
Australia	0.9	0.9	0.9	0.8	1.6
Total	22.0	21.0	20.2	20.0	31.6
Other countries, excluding USSR	1.8	1.8	1.9	1.7	5.1
World, excluding USSR	23.8	22.8	22.1	21.7	36.7

[1]Tentative figures based on preliminary or incomplete data.
[2]Negligible.
Note: The detailed figures do not necessarily add up to the totals because of rounding.



present-day prospects of gold mining. As may be seen from the chart, world gold output (excluding the Soviet Union), which had remained virtually stationary in the Twenties at some 18 million fine ounces annually, suddenly increased in 1930, under the influence of falling costs and commodity prices, by almost 10% to 19.4 million ounces; and from 1931 to 1940 it continued its steady rise as a result of the world-wide depreciation of currencies which brought about an average increase in the price of gold of about 70%. In 1940, world output reached its all-time peak—36.7 million fine ounces—or twice as much as in 1929. From 1941 to 1945 it declined, at an accelerated rate that slowed up only in 1944, output falling in 1945 to 21.2 million fine ounces, although subsequently recovering to some 23.8 million ounces in 1949.

In making comparisons with the Thirties, however, the differences from the present-day situation are far more striking than the resemblances. There is, in the first place, a marked contrast in timing. In the Thirties the principal gold producers devalued at different times —Australia in 1930, England (with its gold-producing dependencies such as the Gold Coast and Southern Rhodesia) and Canada in 1931, South Africa in 1932, the United States in 1933, Belgium with the Belgian Congo in 1935, and France and the Netherlands with their colonial territories in 1936. In 1949, on the contrary, the rise in gold prices was simultaneous, although quite uneven—except that the United States price, which determines the world value of gold, has remained unchanged.

What is even more important is the economic climate in which the changes in gold prices took place. In the Thirties, commodity prices and costs had been falling, while they had increased greatly in the Forties. This contrast in the position of gold mining then and now may be best seen by examining briefly the conditions in Transvaal mines. In spite of a 68% rise in the price of gold, gross receipts per ton milled increased in the Thirties by only 8% since the mines deliberately reduced very substantially the average grade of ore milled. Working costs declined 3%, and profits expanded 31%. From 1938 to 1949, on the contrary, working costs increased 40%, while the grade of ore milled declined 5%. The price of gold increased 21% as a result of sterling depreciation in 1939, and working receipts 16%, but gold mine profits declined 26%.

Today, the ceiling of gold mining receipts has been raised substantially, but the industry's position depends also on the future course of costs and taxation. Wages, which are to some extent adjustable according to a sliding cost-of-living scale, were increased last October by 15%. Rand mine workers are also pressing for a 40-hour week. In addition, imported supplies and equipment are now costing more. As regards imports from countries whose currencies either have been kept stable or have been devalued less than the South African pound, the effect of devaluation on imported prices has been automatic, but higher prices of imports from sterling areas, particularly from the United Kingdom, are almost as certain even if the cost of sterling imports does not rise as much as that of imports from hard currency countries. Particularly those mines that are now in course of development are likely to be adversely affected by the rise in imported equipment costs. As a result of rising costs, the average grade milled is unlikely to be greatly reduced as in the Thirties, nor will the amount of ore milled be greatly increased because of labor shortage. The degree of future taxation in

Table II. Comparison of Conditions in Transvaal Mines 1930, 1938, and 1949

	1930	1938	Percentage change from 1930	Jan.-Aug. 1949	Percentage change from 1938	Oct. 1949	Percentage change from Jan.-Aug. '49
1. Price of gold (s.d.)	85/0	142/7	+68	172/3	+21	248/—	+ 44
2. Grade of ore milled (dwt. per ton)	6.52	4.20	—36	4.00	— 5	3.8	— 5
3. Amount of ore milled (monthly average in millions of tons)	2.6	4.4	+69	4.7	+ 7	5.0	+ 6
4. Gross receipts per ton milled (s.d.)	27/10	30/—	+ 8	34/8	+16	47/9	+ 38
5. Working costs per ton milled (s.d.)	19/5	18/11	— 3	26/5	+40	28/4	+ 7
6. Working profit per ton milled (s.d.)	8/5	11/1	+31	8/3	—26	19/5	+135

The receipts from the sales of gold per ton of ore are affected, on the one hand, by the price paid for gold, and on the other, by the average gold content of the ore milled. (A policy of working lower-grade ores implies that a greater quantity of ore has to be milled annually and the mines have to employ more labor.) The working costs are affected mainly by the changing technique of gold production and by the general level of prices, as these influence wage rates in South Africa and the prices paid there for equipment, materials, etc.

Table III. Free Market Gold Prices

	Bombay		Hong Kong		Alexandria		Paris	
	Rupees per tola	US$ per fine oz[1]	HK$ per tael	US$ per fine oz[2]	E.£ per dirhem	US$ per fine oz[1]	Francs per gram	US$ per fine oz[2]
1946—December	101	81	317	51	162	67	n.a.	n.a.
1947—December	103	83	303	50	172	71	530[4]	54[4]
1948—December	113	91	296	48	153	63	805	79
1949—Predevaluation[3]	114	92	330	49	154	64	[5]615	59
—December	114	63	291	41	169	47	583	52

[1]Converted at the official exchange rate.
[2]Converted at the free market exchange rate.
[3]Mid-September.
[4]February, 1948.
n.a. Not available.

South Africa remains likewise indeterminate. On the basis of present taxation, a large part of the increase in revenue that Rand industry as a whole has secured from the higher gold price—possibly close to 50%—may be absorbed by the South African Treasury.

Conditions such as those briefly described for South Africa apply more or less to other gold-producing countries with devalued currencies. In Canada, federal gold-mining subsidies that were established in 1947 to aid marginal mines with high operating costs were reduced beginning January, 1950, by the full amount of the increase of the Canadian dollar price of gold resulting from devaluation; they are to remain in effect on the reduced basis until the end of 1950. In Southern Rhodesia subsidies were discontinued when producers received the new price of gold following devaluation.

Hoarding and Free Markets

It appears that some 6 million ounces now find their way annually into private hoards of gold.[2] Last year's developments on the free gold markets suggest that the supply of gold is increasing, although demand for gold from China seems to be greatly reduced.

With the European devaluations and the categorical declarations by President Truman and the Secretary of the Treasury that there would be no change in the U. S. gold price, the hoarding of gold seems to have subsided in Western Europe. As a result, prices in premium markets such as Alexandria, Bombay, Hongkong, Paris, and Milan declined noticeably as 1949 ended.

However, premium markets for semi-processed gold widened last year. South Africa permitted sale of semi-fabricated gold at a premium "for use in industry and the arts."

In several countries where dealings in gold had been restricted, the ban was lifted in 1949. Most conspicuous was Hongkong, where a free market was re-established in July. There is a comparatively small domestic market in Hongkong, but much more important is the trading there in gold held outside the colony. Beirut reportedly became a great trading and transport center for gold when, in February, 1949, the governments of Syria and Lebanon authorized free transit of gold through their territories. Forward trading in gold began in Bombay in April, 1949. In October, 1949, the Reserve Bank of India resumed sales of gold on the market, suspended since 1945. The Philippine Government prohibited the sale of gold in December, 1949, along with establishment of foreign exchange control. Following strenuous complaints from gold miners, however, this ruling was relaxed early in January to permit producers to sell up to 75% of their output on the Manila free market.

In Argentina, possession of gold and trading in gold were prohibited toward the end of 1948, but all restrictions were abolished in February, 1949. In Brazil, gold producers early in 1949 ceased to be required to sell to the authorities at the official price more than 20% of their newly-mined gold, instead of 100% as previously, the balance to be disposed on the free market at the prevailing price; gold exports remained, however, prohibited. In Mexico, on the other hand, gold export was permitted in the middle of 1949 subject to payment of an export duty.

Gold from the French mines in Africa has been sold since the beginning of 1949 on the French free market instead of being compulsorily surrendered to the authorities; internal free markets were established in France and French overseas territories in 1948. In Belgium no such market exists, but permission was given in May, 1949, to Congo producers to sell 40% of their newly-mined gold for industrial purposes at prices higher than

[2]The International Monetary Fund in its annual report for 1949 put the disappearance of gold at $200 million annually.

the official price would furnish them.

These examples cannot, however, be interpreted by any means as a world trend toward the lifting of the restrictions on private gold dealings. They either are marginal cases where unenforceable controls have broken down, or represent various attempts by foreign countries to adjust gold trading either to the habits of their population or to their self-interest in terms of possible dollar earnings accruing from commissions, etc. Yet this state of affairs throughout large parts of the world greatly adds to the difficulties of those countries where private dealings in gold at premium prices remain prohibited on the ground that they result directly or indirectly in leakage or diversion of foreign exchange. As in previous years, the policy of the International Monetary Fund in 1949 was to prevent the premium sales of gold from becoming a means of feeding the demand for gold for hoarding purposes and thus diminishing the amount of newly-mined gold that finds its way into monetary reserves.

Prices on the free markets showed divergent trends last year, as may be seen from Table III. In national currencies, quotations in Bombay were about the same toward the end of 1949 as in 1948, in the Middle East they increased somewhat, but in Hongkong they fell toward the end of the year. In Paris quotations were likewise greatly reduced in 1949. In no case may local currency proceeds obtained by the sale of gold actually be converted into dollars except through black markets at various rates of discount. Premium gold prices, therefore, are in no way an indication of the intrinsic value of gold.

Central Monetary Reserves

The third outstanding fact in the position of gold in 1949 was a marked reduction in the gold inflow into the United States. As may be seen from Table IV, United States gold holdings increased last year by only $166 million as against $2,162 million in 1947 (actually the increase in that year was $2,850 million, the difference of $688 million being accounted for by the United States gold subscription to the International Monetary Fund), and $1,531 million in 1948. Table IV also shows that while only two foreign countries added to their holdings in 1947 and very few in 1948, several countries greatly strengthened their reserves in 1949.

Table IV. Central Gold Reserves

(In millions of United States dollars)

	Dec. 1949	Dec. 1948	Dec. 1947	Dec. 1946	Loss (—) or gain (+) during 1949[1]	1948	1947
United States	24,564	24,398	22,868	20,706	+166	+1,531	+2,162
United Kingdom[2]	n.a.	1,590	2,025	2,411	n.a.	— 435	— 386
Switzerland	1,504	1,387	1,355	1,430	+117	+ 32	— 75
Belgium	708a	624	594	735	+ 84	+ 30	— 141
France[3]	523	548	548	872	— 25	.....	— 324
Canada[2]	n.a.	410	294	543	n.a.	+ 116	— 249
Venezuela	372a	323	215	215	+ 49	+ 108	.....
Brazil	317b	317	354	354	.....	— 37	.....
Cuba	299	289	279	226	+ 10	+ 10	+ 53
India	247b	256	274	274	— 9	— 18	.....
Netherlands	195	167	232	265	+ 28	— 65	— 33
South Africa	120b	183	762	939	— 63	— 579	— 177
Italy	252b	96	58	28	+156	+ 38	+ 30
Argentina	161c	142	322	1,072	+ 19	— 180	— 750
Sweden	70a	81	105	381	— 11	— 24	— 276
International Monetary Fund	1,450b	1,436	1,356	15	+ 14	+ 80	+1,341
World (excluding USSR)[4]	35,100d	34,900	34,550	34,050	+200	+ 350	+ 500

a—November. b—October. c—September. d—June.

[1]As far as available, on the basis of figures in the left part of the table.

[2]Including gold earmarked as collateral for loans abroad: 85 million dollars in 1947; 104 million in 1948; and 78 million in 1949.

[3]Estimated.

[4]The aggregate gold and dollar holdings were as follows (in millions of dollars):

	December 1949	1948	1947	1946
Canada	1,127	1,007	508	1,252
United Kingdom	1,688[a]	1,822	2,035	2,587

[a]Provisional: includes some Canadian dollar holdings.

The United Kingdom's gold and dollar reserves, however, shrank last year by $168 million; indeed, between Dec. 31, 1948, and Sept. 18, 1949, the date of devaluation, they fell by $527 million. After devaluation, they increased by $359 million to $1,688 million at the end of 1949. At the end of March, 1948, on the eve of the ERP, the United Kingdom's reserves, which serve as the reserve for the whole sterling area, stood at $2,241 million, a level regarded widely in Britain as the minimum safe level if sterling is to perform its function as an international currency.

This reversal of recent trends may be attributed partly to the inability of a great number of foreign countries to draw further on their depleted reserves, and partly to the European Recovery Program which began in April, 1948. As their gold stocks diminished, foreign countries were even more reluctant last year than in 1947 and 1948 to draw on their last-ditch reserves. On the other hand, since ECA dollars took care of a large part of the requirements of ERP countries either directly or indirectly through off-shore purchases, the flow of gold to the United States greatly slackened. As to the actual purchases of gold in 1949 by some ERP countries, such as Italy and the Netherlands, they were motivated by the desire to restore the reserves to the level prior to the inception of the ERP; during the early ERP period foreign monetary authorities sometimes had to sell gold in order to pre-finance ECA aid, but later the lag in reimbursement was largely eliminated so that the recipient countries were able to replenish their dollar balances.

From another angle also, last year's developments differ from recent trends. In 1949 United States monetary stocks increased by $166 million, while world output (outside the U. S. S. R.) was worth less than $850 million, the United States having thus absorbed about one-fifth of newly-mined gold. In 1948, however, the United States absorbed almost twice as much gold as was produced in the world in that year, and in 1947 more than three times that year's world output. Taking the 16 years from 1934 to 1949, inclusive, the United States monetary stocks increased by $17.8 million, while world new gold output amounted to $15.3 billion. Against this background, last year's developments appear noteworthy, although such redistribution of gold as had taken place has thus far been very moderate.

Silver Production

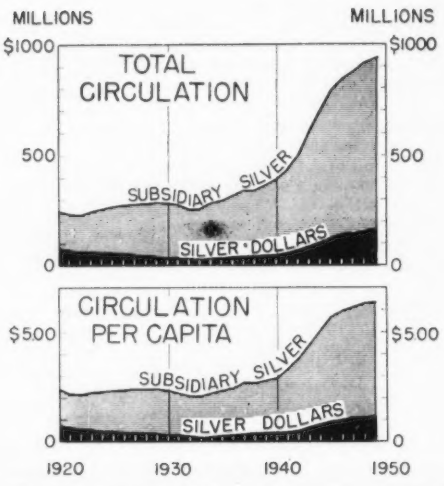
Production of silver by the following countries embraces a substantial percentage of the world's total. Figures are in thousands of troy ounces.

(American Bureau of Metal Statistics)

	United States(a)	Australia (b)	Canada (c)	Mexico (d)	Peru (e)
1946	21,377	6,572	12,544	48,298	12,335
1947	36,053	7,227	12,504	49,198	10,783
1948	36,111	6,469	16,110	45,800	9,288
1949:					
January	2,761	444	976	4,400	490
February	2,821	451	969	4,100	390
March	2,743	566	1,298	4,800	790
April	3,341	623	1,246	4,000	980
May	3,614	498	1,499	4,400	880
June	2,676	555	2,198	4,300	930
July	2,349	534	1,735	3,500	900
August	2,909	...	1,196	4,600	980
September	2,167	496	1,144	4,700	830
October	2,884	530		4,000	820
November	3,101				

(a) Production of domestic refined silver plus receipts of crude by the U. S. Mint. (b) Refined silver production, excluding silver in products exported. (c) Mostly refined in Canada but includes recoverable silver content of products exported, which amounted to 3,295,000 oz. in 1948 and 2,939,500 oz. in January-Sept., 1949. (d) Estimated in small part; includes silver content of products exported. (e) Partly estimated. Prior to 1949 this production was extensively duplicated in the output of foreign silver by refiners in U. S. A.

Circulation of Silver Money in the United States



Silver

Range of silver price movement lowest in years as Mexico seeks stability. India, China out as market factors. Silver dollar circulation up.

DICKSON H. LEAVENS, Colorado Springs, Colo.

THE OFFICIAL PRICE of silver in New York opened at 70c. per oz., 0.999 fine, in January, 1949, rose in the middle of February to 71½c., at which level it remained until August, when it rose slightly, and settled at 73¼c. from September 7 to the end of the year. This range of 3¼c. is the lowest recorded for several decades, except when the price was pegged for a few years in the 1930's by the Treasury's buying policy and during the war by the Office of Price Administration. Its steadiness is understood to be due to the fact that the Mexican Government is supporting the market in order to stabilize the price.

The London official price of silver for essential uses remained at approximate parity with New York, starting the year at 42½d. and rising to 44½d. in the middle of February. When England devalued the pound, the price opened at 64d. on September 20, dropped in a few days to 62d., and rose to 64d. again by October 10, at which level it remained through the year.

Mexico

Mexico, as the largest producer, is interested in keeping up the price. Export of the metal is controlled by the Bank of Mexico and active efforts were made in 1949 to find markets. Over 31,000,000 oz. were sold to the Nationalist Government of China in the summer and early autumn, and 14,000,000 oz. were sold to Saudi Arabia for coinage, part of which was executed in Mexico and part in the United States. In May, some 12,000,000 oz. were minted on coin-like pieces, 0.925 fine, containing exactly a troy ounce of fine silver. These were intended for the Chinese trade and also for the use of small silversmiths, for whom it would be a convenient way of obtaining sterling silver.

India

The Indian silver market continued to be insulated from the rest of the world by Government restrictions on the import of the metal and on the supply of foreign exchange with which to buy it. Some smart operators got around these regulations by shipping silver nitrate from London to India, where it could be converted into bar silver at a profit, but Indian authorities put a stop to this after some 2,000,000 oz. had been shipped. Thus the Bombay market was practically limited to trading in the supplies of silver already in the country. These supplies may total some four or five billion ounces, but only a

small part of them ever come on the market.

During the first half of the year the price ranged between a low equivalent to $1.27 per fine ounce and a high equivalent to $1.55 in June. There was great speculative activity in addition to the legitimate business of supplying the ornament trade. In July, however, the Reserve Bank of India started to offer silver for sale on account of the Government of Hyderabad, and the price dropped sharply, the August high being equivalent to only $1.32. When England devalued the pound, India followed suit, reducing the value of the rupee from 30c. to 21c. The price of silver, however, did not respond to this change, since no silver could be imported and the price was already too high to allow export. During the remainder of the year the price was equivalent, at the new exchange rate, to around 95c.

Continued sales of Hyderabad silver, which had amounted to over 15,000,000 oz. by the end of October, kept the price down. There would seem to be a good possibility of similar sales from the treasuries of other Indian states, for the princes are having their income much cut down under the new Government. Such sales and the probable continued prohibition of import of the white metal will probably keep India out of the world silver market for the next few years.

China

In China, the "gold yuan" paper currency, introduced in August, 1948, continued to depreciate rapidly to about 10,000,000 to the U. S. dollar in May, 1949. Old silver dollars came out of hiding and the Nationalist Government arranged for the coinage of some 15,000,000 new ones at the Denver and Philadelphia mints; these were shipped to China during the summer. In July the Government at Canton officially put the country on a silver basis and began to issue silver certificates supposed to be redeemable on demand. Soon afterward the Government fled to Chungking, then to Chengtu, and finally to Formosa.

The Communists, after capturing Shanghai at the end of May, issued a new paper currency, Jen Min P'iao or People's Bank Notes (abbreviated JMP or PBN) to consolidate earlier currencies issued in the North. These opened at 300 to the U. S. dollar but by December had fallen to 30,000 in the black market. Little news is coming out of Communist China, but it may be assumed that the new Government will have difficulty in keeping its paper from depreciating further and that silver dollars will be used by those who can get them, clandestinely if not allowed by the authorities. China will have to depend on the silver within the country, which can hardly be more than a billion ounces at the most, or about two ounces per capita. Unless the new Government can develop a good export trade, there is nothing to bring silver into the country, and so China would not seem to be a factor in the world silver market in the near future.

United States

The United States Treasury has continued to purchase all newly-mined American silver at the statutory price of 90½c. per fine ounce, issuing silver certificates to the amount of the cost, placing enough bullion in the Certificate Reserve at $1.29+ per ounce to cover them, and placing the remaining "seigniorage silver" in the General Fund as so-called "free silver." Metal from the General Fund has been used when needed for the coinage of subsidiary silver, but there was a balance on the books at the end of the year of about 90,000,000 oz. Of the silver bullion loaned from the Certificate Reserve and the General Fund to war plants, about 300,000,000 oz. have been returned during the year, but some 400,000,000 oz. remain in use. Practically none of the 400,000,000 oz. lend-leased to foreign countries has been returned.

The accompanying chart, based on official Treasury figures, shows the total and per capita circulation of silver money in the United States during the last three decades. Subsidiary silver ranged between $2.00 and $2.50 per capita during the 1920's; apparently this represented the amount needed for actual pocket money in the hands of the public and for till money in banks and business establishments. Circulation began to rise as the country pulled out of the depression and reached $3.00 per capita by the end of 1940. Then it rose very rapidly through the war years.

The present United States per capita circulation of dimes, quarters, and half-dollars is about $6.30. The mints were kept busy throughout and after the war producing these coins and the total stock reached nearly one billion dollars by the middle of 1949. By that time circulation was leveling off and there was an ample reserve supply of the coins in the Treasury, so minting of them was practically suspended in the latter half of the year. The bullion in the General Fund is ample to provide for any foreseeable needs for subsidiary coins in the next few years.

The circulation of silver dollars presents a somewhat different picture. There had never been as much as $1.00 per capita of them in actual circulation, for in most parts of the country silver certificates were preferred. Per capita circulation had been declining steadily since 1907 and reached a low of 22 cents in 1933. Since then, however, it has been steadily rising and now stands at $1.11. A good part of this rise is probably due, not to actual circulation, but rather to hoarding; since gold cannot be hoarded legally, undoubtedly some people have turned to silver dollars, regardless of the fact that as bullion the coin is worth much less than its face value and that hoarding paper money would be as safe.

Silver Policy Opposed

No action on silver was taken by the first session of the 81st Congress during 1949; a bill by Representative Celler for the repeal of the Silver Purchase Act never got out of committee, and the white metal was only occasionally mentioned in debates. In November, however, a subcommittee of the Joint Committee on the Economic Report held hearings on Monetary, Credit, and Fiscal Policies. In preparation for these hearings the subcommittee sent out questionnaires to a number of Government officials, economists, bankers, and others, including a request for opinion as to whether any changes should be made in silver policy. The 27 economists who replied were unanimous in advocating the repeal of silver legislation; out of the 20 bankers and others who replied, 15 opposed the silver policy.

The industrial consumption of silver in the United States has fallen off from the high figures reached during and after the war, and in 1949 was well under 100,000,000 oz. The backlog of demand for silverware seemed to be satisfied and the industry cut down production in the spring, but the seasonal Christmas demand began earlier than usual and prospects at the end of the year were encouraging.

Summary of 1949 Copper Statistics

Copper Institute (in Tons)

UNITED STATES

Production:	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Totals 1949
Crude, primary	53,066	58,751	79,256	75,703	70,703	63,639	56,360	55,930	57,460	62,775	67,479	71,491	772,613
Crude, secondary	16,372	18,190	17,867	15,886	10,555	8,412	6,089	6,349	7,410	6,277	13,119	8,513	135,039
Totals	69,438	76,941	97,123	91,589	81,258	72,051	63,449	62,279	64,870	69,052	80,598	80,004	907,652
Refined	78,298	80,275	88,165	93,873	98,139	92,118	85,638	85,577	79,949	86,882	92,602	94,947	1,056,463
Deliveries, refined	94,070	97,861	113,154	76,134	32,566	45,653	45,316	90,739	103,115	108,192	117,133	107,662	1,031,595
Stocks, refined	91,053	83,841	68,450	76,494	128,441	166,925	212,817	217,167	193,890	164,464	139,199	116,027	.....

OUTSIDE UNITED STATES

Production:	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Totals 1949
Crude, primary	112,314	106,175	119,825	110,734	113,945	110,500	98,472	92,625	99,860	104,101	104,822	97,060	1,270,433
Crude, secondary	891	967	904	1,268	581	681	488	311	443	1,696	1,036	971	10,237
Totals	113,205	107,142	120,729	112,002	114,526	111,181	98,960	92,936	100,303	105,797	105,858	98,031	1,280,670
Refined	96,210	87,004	100,686	96,513	96,743	97,449	81,277	84,304	82,946	85,150	84,571	83,261	1,076,114
Deliveries, refined	77,546	74,327	85,750	75,424	79,644	86,475	71,333	76,634	74,615	75,391	78,898	77,604	933,641
Stocks, refined	172,909	165,462	156,790	159,852	165,271	162,798	161,299	152,840	150,181	151,443	140,161	147,972	.....

Copper

Sharp postwar price correction shakes market. World output maintained at high level despite some curtailment at mines in the United States.

H. H. WANDERS, Market Editor

OUTPUT OF CRUDE COPPER by foreign and domestic producers reporting to Copper Institute totaled 2,188,322 tons in 1949, against 2,260,908 tons in 1948. In view of the drastic decline in prices during the second quarter of the year, the trend toward lower inventories and the curtailment in production resulting from the drop in prices, the record for the entire year was highly satisfactory. The Institute's figures are accepted by the industry as embracing all of the effective production outside of Russia and countries behind the iron curtain.

Production of crude copper for the world, with the exceptions noted, in tons, during recent years was as follows:

	U.S.	Outside U.S.	Totals
1947	976,698	1,238,820	2,215,518
1948	980,498	1,280,410	2,260,908
1949	907,652	1,280,670	2,188,322

Of the total quantity of crude copper produced in 1949, 2,043,046 tons was primary or mine output and 145,276 tons was recovered from scrap. Production of primary copper in the United States fell from 850,088 tons in 1948 to 772,613 tons in 1949. Part of the loss resulted from the strike at Kennecott's large Utah property and part from general curtailment in production in the summer months that was traceable to the decline in the price from the postwar high of 23½c. Valley to 16c. per pound.

As in recent years, the high rate of general industrial activity in the United States was the main support of the world's copper market. The world price moved up and down with the fluctuations in quotations established here. Bulk buying by foreign governments, transactions in the foreign field backed by ECA funds, and purchases in the United States for the stockpile all entered into creating a confusing situation that made long-term planning by producers impossible. Devaluation of currencies afforded temporary relief from rising costs in some producing areas.

Deliveries of copper to this country's stockpile probably exceeded 160,000 tons in 1949, with the "buy American" program pushed vigorously in building up the reserve. Deliveries of refined copper by producers to customers in the United States totaled 1,031,463 tons in 1949, against 1,344,445 tons in 1948. The figures on deliveries to customers do not include metal shipped to the Government's stockpile.

Imports Needed in 1949

The wide spread between domestic new supply of copper and total demands, including stockpile requirements, necessitated continued large imports from all parts of the world, but chiefly from producers situated in the Western Hemisphere. Imports in the 11 months ended November, in terms of copper content, in tons, were as follows:

	Jan.-Nov. 1949
Ore, matte, regulus	106,123
Blister copper	124,005
Refined copper	255,965
Old and scrap	6,103
Composition metal	2,049
Brass scrap	11,336

Copper exports of the United States in the Jan.-Nov. period of 1949 totaled 114,833 tons. In addition to exports of refined metal, the United States shipped copper in the form of tubes, plates, sheets, wire, etc., in the 11 months' period that amounted to 53,451 tons.

Copper Production by Countries

American Bureau of Metal Statistics

	Year 1948	Jan. 1949	Feb. 1949	Mar. 1949	April 1949	May 1949	June 1949	July 1949	Aug. 1949	Sept. 1949	Oct. 1949	Nov. 1949	Dec. 1949
United States (a)	850,088	53,066	58,751	79,256	75,703	70,703	63,639	56,360	55,930	57,460	62,775	67,479	71,491
Canada (refined)	218,064	17,471	16,538	20,076	19,634	20,640	19,761	17,493	18,509	17,703	18,411	.....	.....
Mexico (crude)	57,042	4,462	5,310	5,547	5,578	4,880	4,568	4,316	4,362	3,910	4,944	.....	.....
Chile (b)	469,939	39,931	35,761	40,365	37,140	34,995	33,346	28,155	26,120	.....	.....	.....	.....
Peru (refined)	14,144	1,155	1,472	2,014	2,338	1,893	1,895	2,175	2,031	1,798	1,981	.....	.....
Germany (d)	68,577	10,935	10,337	12,265	12,462	11,537	12,658	14,140	13,446	.....	.....	.....	.....
Japan (refined)	59,893	6,543	6,396	6,929	6,724	6,597	6,857	7,131	7,508	6,899	.....	.....	.....
Australia (crude)	12,830	420	730	1,440	1,131	1,020	1,440	(e)280	(e)420	850	.....	.....	.....
Union of S. Africa (c)	31,692	2,025	1,483	1,723	2,071	3,562	3,134	3,245	2,493	2,690	.....	.....	.....
Rhodesia (crude)	234,647	23,509	21,391	24,422	24,183	26,542	28,107	22,018	24,177	23,181	24,488	25,538	.....
Belgian Congo	170,900	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)

(a) Blister or converter copper reported by Copper Institute as "mine or smelter production or shipments and custom intake." Does not include production from scrap nor from smelting of imported ore except that received from Cuba and the Philippines. (b) Reported as bar copper—blister, electrolytic and fire-refined. (c) Blister and fire-refined. (d) Refined copper produced in bizone area, including both electrolytic and fire-refined. (e) Production down because of coal strike. (f) Not reported on monthly basis.

That the commercial demands for copper in this country would exceed 1,000,000 tons a year in the four postwar years that ended with 1949 was hard to visualize. Use of copper has expanded in several directions and there appears to be no doubt among producers and fabricators that the gains can be sustained in spite of growing competition with aluminum and other materials. The postwar period has been marked by steady expansion in the use of copper in the electrical field and in the building industry. Builders probably consumed more copper in the shape of tubing than ever before. Tubing went into heating installations, water systems, and air conditioning. So insistent was the demand for shapes used in making tubing that the refineries at times were hard-pressed in supplying the needs of the mills.

The wire and cable division continued as the largest single consumer of copper, absorbing more than 60% of the total tonnage used in 1949. Some observers thought that television, with its spreading system of communications, was a factor in expanding the use of copper.

Copper Price Falls

With mine output in this country at the beginning of the year down because of the strike at Utah Copper, and prospects for good business over the first quarter excellent, the market developed no symptoms of what was in store pricewise until lead and zinc quotations began to waver. It was not until the end of March that a Custom Smelter offered copper at a modest reduction of one-quarter cent per pound from the 23½c. Valley basis. Continued weakness in other metals convinced buyers of copper that the postwar readjustment period had set in and new business in copper soon dwindled to near the vanishing point.

Sellers of copper with a background of more than a generation said that at no time did they experience so complete a stoppage in business. The scramble to reduce inventories of refined copper spread to the finished products. This policy continued for several months. The lack of demand was referred to as a "buyers' strike." However, actual use of copper remained relatively high throughout the summer and gradually confidence in the ability of sellers to hold the price at the 16c. level, the low for the year, returned and business improved.

Producers, caught between high costs and falling prices, lost no time in curtailing output. Smelter output of crude copper in the United States declined from 79,256 tons in March to 55,930 tons in August, but, stimulated by the revival in business and higher prices, returned to 71,491 tons in December.

Fabricators' Copper Shipments

Shipments of copper products by fabricating plants in the United States in December contained 86,097 tons of refined copper, against 107,965 tons (revised) in November. Shipments by the group in 1949 totaled 1,055,885 tons, which compares with 1,394,307 tons in 1948. Shipments by months during the last two years, in tons, follow:

	1948	1949
January	127,227	109,551
February	115,238	93,474
March	120,167	89,834
April	117,331	65,461
May	112,730	61,383
June	120,172	71,124
July	103,488	61,220
August	115,036	88,088
September	126,236	114,760
October	126,700	106,928
November	108,266	(a) 107,965
December	101,716	86,097
Total	1,394,307	1,055,885

(a) Revised

Stocks of refined copper in the hands of fabricators at the end of December totaled 352,332 tons, against 327,803 tons a month previous and 379,346 tons at the beginning of 1949.

Duty Suspended Again

Legislation was enacted late in March that extended the suspension of the 2c. import duty on copper to June 30, 1950. A dispute developed unexpectedly over the duration of the period, one faction contending that it should be suspended for two years and the other maintained that one year would be sufficient. A compromise was reached and Congress agreed to a 15 months' suspension. There were no important differences over the need of importing copper in volume. Deliveries to domestic consumers averaged more than 100,000 tons a month over the first quarter and would have been greater except for the reduced offerings by strikebound Kennecott. The deliveries to customers do not include any shipments destined for

the Government's strategic stockpile.

A bitter controversy over the further extension of the legislation suspending the duty is likely to develop in 1950. Consumers and producers who regard copper as being an international commodity will certainly ask for the continued free entry of the metal from abroad. On the other hand, domestic producers, who can see no end to rising costs in this country and a possible reduction in demand, question the need for further extension of the duty-free status of copper. A slump in the domestic consumer demands for copper, some argue, might well be offset by increased sales to the Government for its stockpile. It is estimated that stockpile purchases in 1950 may total in the neighborhood of 15,000 tons a month.

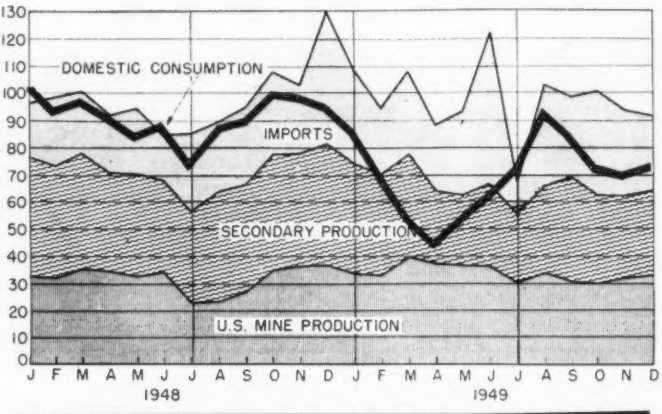
The imposition of the import duty on copper would separate the two markets, possibly to the disadvantage of the foreign product. Normal trade on a world-wide scale has not been restored and copper producers in the Western Hemisphere, who have been disposing of substantial tonnages in the United States, would hardly welcome a divided market. In other words, international political considerations still enter into the problem.

Competition Increasing

During 1949, in spite of increased competition in semi-fabricated and finished products containing copper, demand for copper continued well above normal. However, the demands for copper, excluding the stockpile take, moderated compared with the preceding year. Real shortages of copper products did not exist. Temporary shortages in some shapes occurred because of work stoppages. Fabricators bought copper rather freely toward the end of the year on rumors that the price might rise early in 1950. There was talk of a squeeze in February (1950) copper. However, production at the mines in this country is expanding. The 1949 rate of consumption was a reflection of extraordinary high level of activity in the electrical, construction and automobile industries. Production in these industries will remain high in 1950, but some slackening in activity is highly probable. Competitive conditions in the copper industry should increase and it will be a buyers' market over most of the year. Stockpiling will be a sustaining factor. Tariff uncertainty could bring on a period of price unsettlement in the second quarter.

Lead Supply and Domestic Consumption—1948-1949

(In thousands of short tons, Oct.-Dec. 1949 estimated)



Lead

Sharp swings in demand liven year for lead producers. Substitution cuts into lead's markets. Foreign metal, stockpiling still strong factors.

ROBERT L. ZIEGFELD
Secretary-Treasurer, Lead Industries Association, New York, N. Y.

A GENERAL CATCHING UP on war-created backlogs, substitution resulting from high prices, increased domestic mine production and imports, all were factors contributing to the rather violent readjustment of the lead market in 1949. From unprecedently high lead prices, there was a precipitous tumble with only temporary interruptions.

When New Year's Day, 1949, dawned, the price of lead stood at its all-time record high of 21½c. per lb., which it had reached on Nov. 1, 1948. Industrial consumption in the year that had just closed had amounted to 1,129,000 tons, with a few thousand additional tons having gone to the Government's permanent military stockpile. Only the fact that no more lead had been available kept consumption and stockpiling figures from being even larger.

Yet only a little more than two months later, on March 8, 1949, the lead price broke and continued to descend with large and rapid strides until it hit 12c. a lb. on May 26, 1949. Buying during much of this period came to a virtual standstill except for Government account.

Then with almost equal rapidity the market made an about face and during July and August a mad scramble for lead pushed the price back up to 15⅛c. a lb. This period of activity was again followed by one in which buyers held coldly aloof and the price once more slipped back to 12c. a lb., where it held until the end of the year. Discussion of the year naturally falls into three periods: the first six months of weak markets, the next

Table I. Lead Price Changes*

(Cents per Pound New York)

Nov. 1, 1948	21.50
Mar. 8, 1949	19.50
Mar. 14	18.00
Mar. 28	17.00
Apr. 1	16.00
Apr. 6	15.00
May 6	14.00
May 23	13.00
May 26	12.00
July 8	13.00
July 12	14.00
July 25	14.25
July 27	14.50
Aug. 2	14.75
Aug. 8	15.125
Sept. 26	14.75
Oct. 3	14.25
Oct. 7	13.75
Oct. 14	13.00
Nov. 10	12.75
Nov. 16	12.50
Nov. 21	12.00

*Engineering & Mining Journal.

Lead Consumption by Industries

(In Short Tons)

	1948*	1949 Estimated
White Lead	34,300	23,000
Red Lead and Litharge (a)	58,900	55,000
Storage Batteries	373,300	285,000
Cable Covering	184,300	112,000
Building (b)	60,800	51,000
Tetraethyl	83,800	96,000
Ammunition	42,400	22,000
Foil	3,100	3,000
Bearing Metal	41,500	27,000
Solder	67,500	59,000
Type Metal	28,700	25,000
Calking	40,200	35,000
Other Uses	110,200	77,000
Total	1,129,000	870,000

*American Bureau of Metal Statistics.
(a) Exclusive of oxides for storage batteries.
(b) Chiefly pipe, sheet and extrusions. Includes lead used in chemical construction.

two or three months of renewed strength, and a second period of weakness, as Table I readily reveals.

Looking back to the early part of the year, it appears that consumers of lead all along the line suddenly realized that they had caught up with the pent-up demand caused by the war and attempted to adjust their operations to more normal activity. At the same time, the storage battery industry, which consumes about a third of all the lead used in the United States and which was geared to a high rate of production, was faced with one of the mildest winters in years in that part of the country where most automobiles are concentrated. This meant less wear and tear on automobile batteries and a greatly reduced demand for replacement batteries, which constitute more than three-quarters of the battery market. Battery dealers and manufacturers both were well stocked, so the battery industry practically went out of the lead market for several months.

The power and communications industries slackened their accelerated post-war construction programs and the demand for lead-covered cable was reduced. The same applied to capital expenditures in the chemical and process industries using lead and lead-lined equipment to handle corrosive chemicals. These conditions applied more or less throughout all the industries using lead, one major exception being the producers of anti-knock fluid for gasoline, whose use of lead to make tetraethyl lead actually increased.

Accompanying this general slackening of demand which resulted from refilled pipe lines, so to speak, 1948's high prices and scarcity of lead began to have their effect by encouraging substitution of cheaper materials. The cable industry, for example, began to use substitutes commercially, one of the most important being a combination sheath of aluminum and polyethylene. In the paint industry the high price led to a reduction in the lead content of paints in general, and in a few well publicized cases to elimination of lead completely from paint formulations. The price also pushed more and more collapsible tube users over to aluminum.

All of this added up to a reduction of industrial demand for lead from 1,129,000 tons in 1948 to an estimated 870,000 tons in 1949. Of course, sizable purchases for the Government stockpile in 1949, which have variously been reported at over 200,000 tons, against only minor purchases in the preceding year, helped to close the gap somewhat between supply and demand.

While all this was happening to consumers' demands for lead during the first half of 1949, supplies of lead continued to come on to the market at an accelerated rate. Spurred by high prices and heavy demands for their products, miners had caught up on long delayed exploration and development work and were in a position to mine increased tonnages. This they did in the first half of 1949 to the tune of a monthly average increase of nearly 4,000 tons over the average for all of 1948.

Imports, which were large in 1948, continued to increase as need for dollars abroad and a shrinking foreign market offered an incentive for sale in the United States. The import duty of 1-1/16c. a lb. on pig lead and ¾c. a lb. on ore and concentrates had been suspended in June, 1948, until June 30, 1949, to encourage imports at a time when lead was in short supply here. Therefore, there was no duty on foreign lead coming into this country during the first six months of 1949. The bill suspending the duty was not extended because of the oversupply of lead in the world and the duty was thus automatically restored on July 1, 1949.

Only secondary lead supplies showed a downward trend in the first half of 1949, so that the net result was increased supplies and greatly decreased consumption during that period. Consequently there was a sizable increase in refiners' stocks to a peak on July 1 and an increase in manufacturers' stocks up to April 1, at which time they began to draw on these stocks while keeping purchases at a low level.

(*Continued on page 87*)

United States Lead Supplies

(In Short Tons)

	1948*	1949 Estimated
FROM:		
Domestic Ore	390,480	405,000
Foreign Ore	71,554	110,000
Scrap	473,912	385,000
Imports of Refined Lead	246,684	270,000
Total Supplies	1,182,630	1,170,000
LESS:		
Increase in Stocks at Primary Smelters and Refineries	20,344	60,000
	1,162,286	1,110,000
Industrial Consumption	1,129,185	870,000
Change in Consumers' Stocks	23,916	—10,000**
	1,153,101	860,000
Apparent excess of supply over industrial consumption***	9,185	250,000

*American Bureau of Metal Statistics.
**Decrease.
***Includes lead purchased for Government stockpile.

E & M J Annual Average Metal Prices — 1897 to 1949

Year	Copper (a) Electrolytic Refinery	Lead Common, New York	Zinc, Prime Western (b) E. St. Louis	Tin, (c) New York	Silver, (e) New York
1897	11.29	3.580	4.120	13.67	59.790
1898	12.03	3.780	4.570	15.70	58.260
1899	16.67	4.470	5.750	25.12	59.580
1900	16.19	4.370	4.390	29.90	61.330
1901	16.11	4.330	4.070	16.74	58.950
1902	11.626	4.069	4.840	26.79	52.160
1903	13.235	4.237	5.191	28.09	53.570
1904	12.823	4.309	4.931	27.99	57.221
1905	15.590	4.707	5.730	31.358	60.352
1906	19.278	5.657	6.048	39.819	66.791
1907	20.004	5.325	5.812	38.166	65.237
1908	13.208	4.200	4.578	29.465	52.864
1909	12.982	4.273	5.352	29.725	51.502
1910	12.738	4.446	5.370	34.123	53.486
1911	12.376	4.420	5.608	42.281	53.340
1912	16.341	4.471	6.799	46.096	60.835
1913	15.269	4.370	5.504	44.252	59.791
1914	13.602	3.862	5.061	34.301(d)	54.811
1915	17.275	4.673	13.054	38.590	49.684
1916	27.202	6.858	12.634	43.480	65.661
1917	27.180	8.787	8.813	61.802	81.417
1918	24.628	7.413	7.890	88.750	96.772
1919	18.691	5.759	6.988	63.328	111.122
1920	17.456	7.957	7.671	48.273	100.900
1921	12.502	4.545	4.655	29.916	62.654
1922	13.382	5.734	5.716	32.554	67.528
1923	14.421	7.267	6.607	42.664	64.873
1924	13.024	8.097	6.344	50.176	66.781
1925	14.042	9.020	7.622	57.893	69.065
1926	13.795	8.417	7.337	65.285	62.107
1927	12.920	6.755	6.242	64.353	56.370
1928	14.570	6.305	6.027	50.427	58.176
1929	18.107	6.833	6.512	45.155	52.993
1930	12.982	5.517	4.556	31.694	38.154
1931	8.116	4.243	3.640	24.467	28.700
1932	5.555	3.180	2.876	22.017	27.892
1933	7.025	3.869	4.029	39.110	34.727
1934	8.428	3.860	4.158	52.191	47.973
1935	8.649	4.065	4.328	50.420	64.273
1936	9.474	4.710	4.901	46.441	45.087
1937	13.167	6.009	6.519	54.337	44.883
1938	10.000	4.739	4.610	42.301	43.225
1939	10.965	5.053	5.110	50.323	39.082
1940	11.296	5.179	6.335	49.827	34.773
1941	11.797	5.793	7.474	52.018	34.783
1942	11.775	6.481	8.250	52.000	38.333
1943	11.775	6.500	8.250	52.000	44.750
1944	11.775	6.500	8.250	52.000	44.750
1945	11.775	6.500	8.250	52.000	51.928
1946	13.820	8.109	8.726	54.544	80.151
1947	20.958	14.673	10.500	77.949	71.820
1948	22.038	18.043	13.589	99.250	74.361
1949	19.202	15.364	12.144	99.336	71.930

(a) Lake copper 1897-98; domestic market since 1932. (b) New York zinc 1898-1902. (c) 99 percent tin 1897 to 1920, inclusive; Straits quality thereafter. (d) Average for eleven months. (e) New York Official. All quotations in cents per pound, except for silver, which are in cents per troy ounce.

E & M J Weekly Average Metal Prices — 1949

	Copper Domestic Refinery	Copper Export Refinery	Lead N. Y., Common	Zinc E. St. Louis, Pr. Western	Tin N. Y., "Straits"	Silver N. Y., Official
Jan. 5	23.200	23.430	21.500	17.500	103.000	70.000
Jan. 12	23.200	23.425	21.500	17.500	103.000	70.000
Jan. 19	23.200	23.442	21.500	17.500	103.000	70.000
Jan. 26	23.200	23.425	21.500	17.500	103.000	70.000
Feb. 2	23.200	23.425	21.500	17.500	103.000	70.000
Feb. 9	23.200	23.438	21.500	17.500	103.000	70.000
Feb. 16	23.200	23.442	21.500	17.500	103.000	70.950
Feb. 23	23.200	23.425	21.500	17.500	103.000	71.500
Mar. 2	23.200	23.425	21.500	17.500	103.000	71.500
Mar. 9	23.200	23.425	20.833	17.500	103.000	71.500
Mar. 16	23.200	23.425	18.750	17.500	103.000	71.500
Mar. 23	23.200	23.425	18.000	17.250	103.000	71.500
Mar. 30	23.150	23.425	17.500	16.000	103.000	71.500
Apr. 6	22.950	23.342	16.000	15.667	103.000	71.500
Apr. 13	22.950	23.217	15.000	15.000	103.000	71.500
Apr. 20	21.200	21.458	15.000	13.667	103.000	71.500
Apr. 27	19.700	19.925	15.000	13.000	103.000	71.500
May 4	18.800	19.175	15.000	12.500	103.000	71.500
May 11	17.965	18.258	14.167	12.250	103.000	71.500
May 18	17.700	17.992	14.000	12.000	103.000	71.500
May 25	17.625	17.850	13.500	11.667	103.000	71.500
June 1	17.325	17.496	12.000	11.000	103.000	71.500
June 8	17.325	17.500	12.000	10.625	103.000	71.500
June 15	16.475	16.675	12.000	9.417	103.000	71.500
June 22	15.800	16.008	12.000	9.000	103.000	71.500
June 29	15.700	15.925	12.000	9.000	103.000	71.500
July 6	15.906	15.925	12.000	9.000	103.000	71.500
July 13	17.070	17.138	13.093	9.000	103.000	71.500
July 20	17.325	17.540	14.000	9.250	103.000	71.500
July 27	17.325	17.550	14.167	9.750	103.000	71.500
Aug. 3	17.325	17.550	14.583	10.000	103.000	71.500
Aug. 10	17.325	17.554	14.938	10.000	103.000	71.500
Aug. 17	17.325	17.550	15.125	10.000	103.000	71.500
Aug. 24	17.325	17.550	15.125	10.000	103.000	71.800
Aug. 31	17.325	17.550	15.125	10.000	103.000	73.000
Sept. 7	17.325	17.550	15.125	10.023	103.000	73.063
Sept. 14	17.325	17.550	15.125	10.000	103.000	73.250
Sept. 21	17.325	17.550	15.125	10.000	103.000	73.250
Sept. 28	17.325	17.550	14.938	10.000	101.250	73.250
Oct. 5	17.325	17.550	14.500	9.625	96.000	73.250
Oct. 12	17.325	17.550	13.850	9.250	96.000	73.250
Oct. 19	17.325	17.550	13.125	9.250	96.000	73.250
Oct. 26	17.325	17.550	13.000	9.250	95.500	73.250
Nov. 2	17.325	17.550	13.000	9.554	95.000	73.250
Nov. 9	17.981	18.133	13.000	9.765	95.000	73.250
Nov. 16	18.200	18.425	12.700	9.764	95.000	73.250
Nov. 23	18.200	18.425	12.250	9.754	87.500	73.250
Nov. 30	18.200	18.425	12.000	9.750	85.000	73.250
Dec. 7	18.200	18.425	12.000	9.750	81.333	73.250
Dec. 14	18.200	18.425	12.000	9.750	78.958	73.250
Dec. 21	18.200	18.425	12.000	9.750	78.458	73.250
Dec. 28	18.200	18.425	12.000	9.750	78.000	73.250

By mid-year more confidence returned to the market. The storage battery industry is always more active in the last six months of the year and 1949 was no exception. Other lead consuming industries also picked up. Thus in July and August purchases of lead were heavy, sales actually reaching the highest level of the year. At the same time the effect of the lower price began to be felt on mine production so that a reduction of about 10% took place. Therefore, on July 8 the price again turned upward, finally reaching 15⅛c. a lb., where it held until Sept. 26.

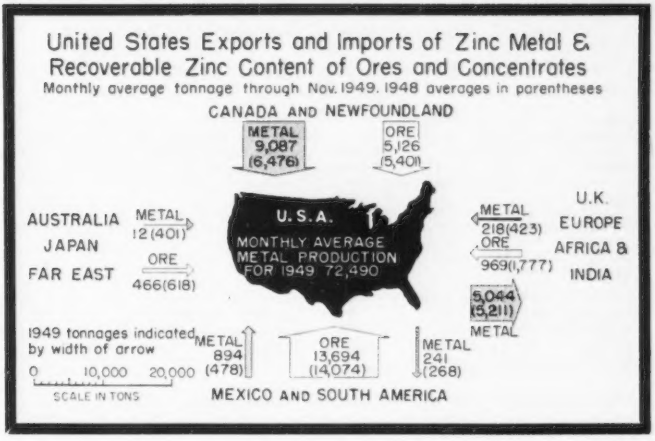
The heavy purchasing during that period seemed pretty well to satisfy industrial needs and could not continue at such a rate. Sales fell sharply until December, when some activity reappeared in the market. In late September the British announced devaluation of the pound, followed by similar announcements of devalued currencies by a number of other countries. Combined with the lack of buying in the United States, this devaluation undoubtedly had a serious effect on the lead market.

Decreased demand in the United States and increased offerings from abroad together pushed the price down once more to 12c. a lb. on Nov. 21, where it remained until the year-end.

The outlook for 1950 is clouded, to say the least. Consumption in some lines, notably storage batteries, should be better unless another mild winter is in store in the more populous states. On the other hand, it is not yet clear whether lead can regain some of the markets lost through substitution. Lower prices may help, but undoubtedly some of the substitution will be permanent, particularly where it has involved changes in manufacturing equipment. One bright spot in the picture is that manufacturers' inventories of lead are low.

At present prices and until costs can be brought into line, mine production is not likely to reach the high levels of early 1949, when it hit a rate of more than 450,000 tons a year. But until the economies of Europe are on a sounder basis, there is little likelihood of relief from the pressure of foreign lead on the domestic market.

Government stockpiling policies, in any event, will be an important consideration in 1950. It is pretty well known that purchases will continue at a relatively high level, about that of 1949, until at least the end of the fiscal year.



Zinc

Smelter output in 1949 sets record for peacetime year. Consumption drops, reflecting general business readjustment, but picks up at year's end.

CHARLES R. INCE, Manager of Metal Sales, St. Joseph Lead Co., New York

THE YEAR 1949 was a period of readjustment not only in industry generally, as indicated by the Federal Reserve Board's Index of Industrial Production which showed a decline from the previous year's high of 195 to a low of 161 in May, but also in the basic metals and zinc was no exception. The unsatisfied demands for goods of all kinds which developed during the postwar years evidently were finally met early in 1949 and an adjustment to normal markets was inevitable. Fortunately, the period of readjustment was short and, as the year ended, the Industrial Index was again on the way up and would have been substantially above the 174 recorded for September if it had not been for the debilitating effects of the coal and steel strikes.

The zinc market along with the other non-ferrous metal markets reflected the fluctuations in the country's industrial activity. Starting the year at 17.5c. a pound and very firm at that level due to the extremely low stocks in producers' hands, the market encountered the decline in demand as industrial activity went off starting in February. From then on the price weakened steadily until it hit the low point of 9c. in June. With the improvement in business that started in July, the zinc market advanced and, other than a temporary setback during the steel strike, showed continued strength, ending the year with zinc being offered at 9.75c. and 10c.

So far as supply goes, the zinc smelters turned out the greatest tonnage of metal in their history for a peacetime year, exceeding the previous year's high by about 20,000 tons for a total production of 869,882 tons. This was quite an achievement in view of the fact that strikes at smelter the early part and end of the year plus strikes at mines in the Northwest, materially affected smelter production. This production, coupled with imports of around 120,000 tons of

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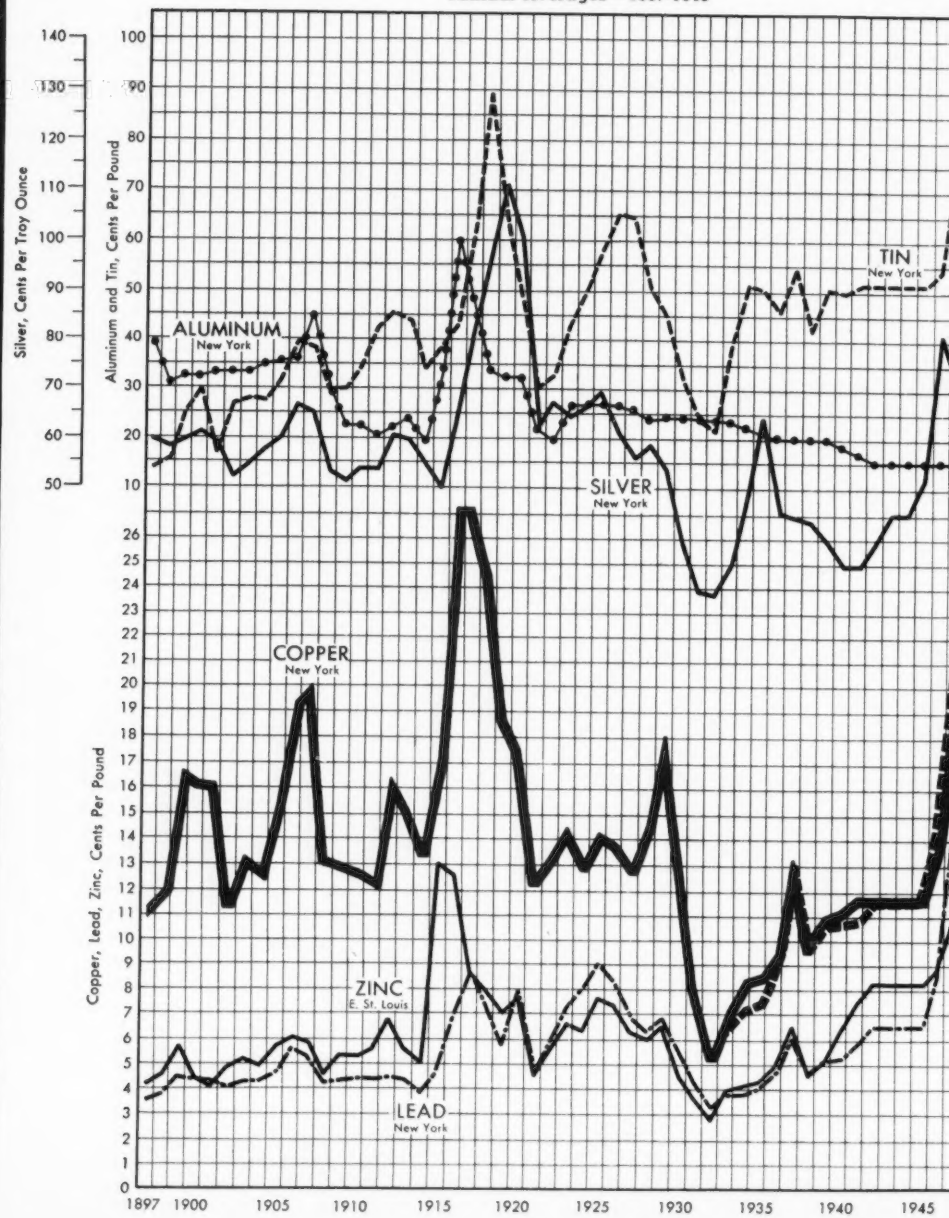
Annual Averages — 1897-1949



Metal Prices

Journal and E & M J Metal and Mineral Markets

olishing Company, Inc., New York

Weekly Averages — 1949

Table I. Comparison of Supply and Demand

SUPPLY	Tons	DEMAND	Tons
1948			
Domestic production (Including secondary)	850,000	Domestic consumption	817,000
Imports	93,000	Export and drawback	70,000
		Shipments for Gov't. account	60,000
	943,000		947,000
Deficit	4,000		
	947,000		
1949*			
Domestic production (Including secondary)	870,000	Domestic consumption	695,000
Imports	120,000	Export and drawback	57,000
		Shipments for Gov't account	113,000
	990,000		865,000
		Surplus	125,000
			990,000

*Estimated—based on latest figures available

Table II. Consumption of Zinc by Industries in Tons*

	1948	1949	Change from previous year
Galvanizing	371,000	350,000	— 5.5%
Die casting and zinc-base alloys	234,000	190,000	—19.0%
Brass products	109,000	75,000	—31.0%
Rolled zinc	77,000	60,000	—22.0%
Zinc oxide and other uses	26,000	20,000	—23.0%
	817,000	695,000	—15.0%

*Bureau of Mines figures with last 4 months 1949 estimated.

metal, provided domestic consumers more than sufficient zinc to meet their needs, unlike the previous years when demand was consistently higher than the available supply.

Withdrawals from stocks and current production of smelters totaled 796,766 tons, a considerable decline from the previous year's. This includes shipments for domestic consumption, for export and drawback, plus a substantial tonnage earmarked for Government account. For a more concise picture, the accompanying "balance sheets" (see Table 1) show the relative supply and demand for metal during the past two years.

Low Price May Result in Concentrates Shortage

In view of the fact that supply and demand were virtually in balance in 1948, with consumption limited by the amount of metal available, it is not surprising that the price advanced from 10.5c. to 17.5c. per lb. during that year. Conversely, it was not entirely unexpected that with an apparent over supply of 100,000 tons in 1949, the zinc price should decline from the 17.5c. level to 9c. However, the decline was rather precipitous and may have carried to a level which could cause a shortage of concentrate supply to the smelters. Indications of this were not lacking. As the year ended there were definite shortages of concentrates in certain sections of the country and for the year as a whole, smelter consumption exceeded supplies of concentrates by nearly 160,000 tons. Not only were imports of zinc concentrates below the previous year's rate, but domestic production also declined steadily during the last half of the year and, abetted by the strikes, at the year's end was running at a rate 30% below the previous year's. Domestic mine production in 1949 appears to have been in the neighborhood of 580,000 tons compared with 630,000 tons in 1948. As indicated in the flow-chart, imports of concentrates were 243,000 tons and accounted for about one-third of domestic smelter feed. Imports of metal were running at a rate higher than the previous year as 1949 ended, but the rate may decline in 1950 owing to the fact that substantial tonnages were shipped into the domestic market in the last quarter from Canada and represented liquidation of stocks that had accumulated at Canadian smelters earlier in the year.

Zinc Consumption Parallels General Business Level

So much for the supply picture, with regard to demand, exports showed a decline of about 18% from 1948, while Government stockpiling nearly doubled. However, the latter was not sufficient to offset the drop in domestic consumption of 15%, amounting to 122,000 tons. Table II shows contrasts for the two years.

While the over-all decline in zinc consumption appears to have been in line with the general industrial decline of the country, there was a marked difference in the degree among the various consuming industries. Fortunately, the largest consumer of zinc, the galvanizing industry, was off only a few percent and probably would not have shown any decline if it had not been for the steel strike in October. This is not surprising as shipments of galvanized sheets in September just prior to the strike hit an all-time high of 196,000 tons and, even with a drop to 56,000 tons in October, shipments for the year were in excess of the same period of the previous year. Die castings, the second largest consumer of zinc, were roughly in line with the decline in durable goods production. The drop in consumption would have been greater if it were not for the fact that the automotive industry, the largest outlet for zinc die castings, produced a record 6,200,000 cars and trucks. It is interesting to note that the use of aluminum in die casting declined to even a greater extent than zinc, so there was a pick-up in the ratio of zinc to aluminum from the 78.5% during the previous year to 81% in 1949.

Brass products showed considerably more than the average decline for the reason that along with the general industrial recession, there was a greater than normal return of scrap to the mills during most of the year that materially cut into their requirements for primary metals. Rolled zinc suffered not only from the general drop in business activity but also a heavy liquidation of inventory on the part of its customers during the first nine months of the year. The use of zinc metal in the manufacture of French Process zinc oxide showed

more than the average decline due in part to a strike at the plant of the largest producer.

New Developments Expected to Increase Zinc Use

There were several new developments among the zinc-consuming industries during the year that bid well to make up in the coming year for some of the loss in consumption in 1949. In the galvanizing industry the introduction of continuous galvanizing on a large scale should cut costs of production and improve the competitive position of galvanized sheet. A new zinc alloy coating containing a small amount of aluminum was introduced in the galvanizing field, whose tighter zinc adherence and improved corrosion resistance should enlarge the market for zinc coated steel. The American Die Casting Institute sponsored the Certified Zinc Alloy Plan, assuring the purchaser and user of zinc alloy die castings of the quality and hence mechanical and physical properties of the castings. With such assurance, it can be expected that manufacturers will make still greater use of the products of this comparatively young and vigorous industry whose phenomenal growth in recent years has made it the second largest zinc consumer. Highlighting development in the brass industry was the introduction of a unique casting machine which continuously casts rectangular section brass bars 24x2½-in.x10-ft. long, weighing over a ton each. Coupled with the latest improvement in continuous cold rolling, the process affords improved product quality and economy of operation.

As for the future, the prospects for an improvement in the zinc market were quite good as the year ended. Industrial activity had resumed its upward swing after the interruption caused by the coal and steel strikes. Barring strikes in one or more basic industries, 1950 should show a higher level of industrial production. An improvement of only 10% would mean an increase in zinc consumption by about 70,000 tons, which would go far to take up the surplus that existed in 1949. While exports may decline somewhat due to anticipated cutbacks in ECA funds, they should be more than offset by increased shipments to the Government stockpile under toll agreements for conversion of Government concentrates and the possible renewal of metal purchasing.

United States Tin Supply and Allocations
(Office of Domestic Commerce)
In Long Tons

	Smelter Output	Imports	Total Receipts	Allocations	Stocks at End (a)
1948	36,677	48,954	85,631	62,411	24,322
1949:					
January	3,257	585	3,842	4,374	23,929
February	3,254	2,538	5,792	3,837	25,199
March	3,104	8,792	11,896	3,295	27,903
April	2,851	8,513	11,364	2,485	31,116
May	3,007	4,231	7,238	2,296	30,550
June	3,006	4,080	7,086	2,863	33,704
July	2,910	4,239	7,149	3,966	31,146
August	3,005	5,180	8,185	4,418	21,703
September	2,910	6,569	9,479	4,169	20,873
October	2,964	7,224	10,188	3,918	22,403
November	2,994	4,887	7,881	3,148	23,129
December	2,791	....	....	....	22,452
Total	36,053	....	....	....	....

(a) Stocks on hand do not include tin transferred to the Government's permanent stockpile.

Tin

Price declines sharply following devaluation of currencies and lifting of controls on use and distribution. Output in excess of requirements

H. H. WANDERS, Market Editor

STIMULATED by the comparatively high prices of recent years, world mine output of tin continued to expand during 1949, moving up toward the prewar level of approximately 170,000 long tons. Production in 1948 was 153,500 tons and in 1947 it was estimated at 114,000 tons. The annual average for the 1935-39 period was 170,300 tons. The gain in production during 1949 was achieved in spite of political unrest in Malaya, continued inefficiency of labor, higher costs, and growing uncertainty over the stability of the price structure.

Consumption declined in all important consuming centers. Only a small percentage of the decline in use in the United States and the United Kingdom was offset by gains in consumption in Germany, Japan and Italy. The Tin Study Group estimated that world consumption declined to the annual rate of 122,000 tons.

World stocks increased from 134,100 tons at the end of 1948 to 141,100 tons on June 30, 1949. World stocks, consisting of metal contained in concentrates and pig tin, declined to 128,400 tons on Sept. 30, 1949. Part of the reduction in the visible supply during the third quarter resulted from the transfer of tin to the United States stockpile.

Tin was the last of the important non-ferrous metals to be freed from war control. In the United States, the controls on imports, distribution and inventories were not completely eliminated until Dec. 1, 1949. General Preference Order M-43, as amended on that date, retained only the reporting features required for statistical purposes.

Consumers began limiting their purchases early in the year, believ-

ing that the demand-supply situation had already changed radically in their favor and, with copper, lead and zinc prices sharply lower, a downward revision in tin would have to come sooner or later. Producers were worried, but hoped that the United States Government would step into the picture and support the market by taking on substantial tonnages for its stockpile.

After a meeting of the Tin Study Group, held in London in June, it was said that there was an existing and growing excess in production over commercial needs of about 32,000 tons for 1949 and possibly a like amount for 1950.

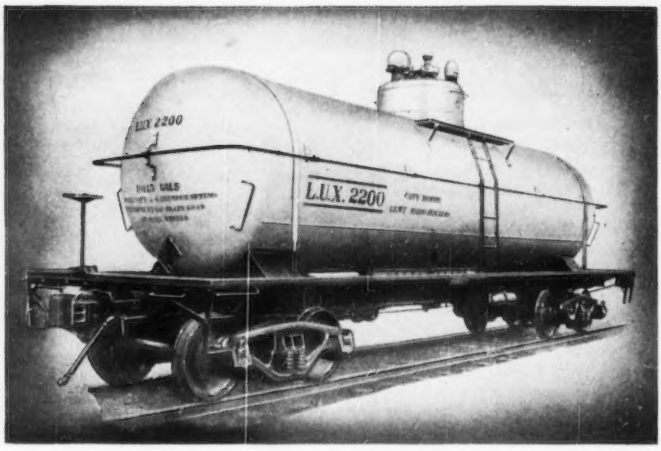
During the year it was stated in press reports from London that the United States intended to accumulate between 200,000 and 300,000 tons of tin for its stockpile. Around midyear it was claimed unofficially that the stockpile contained less than 60,000 tons of tin.

Devaluation of the pound sterling on Sept. 18, from $4.03 to $2.80, was the spark that set off a general downward revision of tin prices. In London the official quotation for tin was adjusted upward, but not to the full extent that devaluation affected other world commodities. Tin looms large in the British economy as an earner of dollars. The Ministry of Supply offered Straits quality tin for prompt and October shipment at 95c. per lb., New York.

Following these developments, the RFC temporarily withdrew its $1.03 quotation for spot tin. The settling prices for spot tin on Dec. 31 was 77½c.

Trading in tin on the London Metal Exchange resumed Nov. 15.

As for the outlook, tin presents a difficult problem. Supply as 1950 opened was in excess of commercial needs. However, large-scale purchases for the stockpile could lift the pressure from the market. The price has fallen sharply and this, under ordinary circumstances, would bring about a drop in output. Currency devaluation undoubtedly has eased the impact of the fall in prices in important producing areas. Most producers favor an international agreement. Revival of the buffer pool is advocated. Authorities in the United States are opposed to purchasing tin for the strategic reserve under any arrangement that would support the price in the interest of the producer. Consumers in this country believe that the "corrective" movement in tin will continue for some time and they have nothing to lose by purchasing the metal as needed.



ALUMINUM USAGE for transportation equipment increased in 1949. Aluminum tank cars built in 1949 exceeded the total for the three previous years.

Light Metals

Aluminum shipments drop during year but recover at close. Strikes and power shortages slow production. Primary magnesium production increases 12 percent.

RICHARD J. LUND, Battelle Memorial Institute, Columbus, Ohio

LIKE OTHER BASIC RAW MATERIALS, aluminum felt the effects of the general business recession in 1949. Not badly, however, since production dropped only slightly and prices held firm. Following a fairly strong first quarter, shipments of wrought products and castings started a downward trend that ended in midsummer. Recovery was relatively fast, and the year ended at levels as good or better than those at the start of the year.

Magnesium fared better. Primary production rose about 12%, shipments (based on the January-October record) increased about 15%, and castings shipments jumped almost 50%. Even with this improvement, however, primary output is still comparatively low, representing only a little more than 50% capacity operation at the single processing plant—that of Dow Chemical Co. Magnesium Division at Freeport, Tex.

Aluminum

OUTPUT OF PRIMARY ALUMINUM in 1949 amounted to about 600,000 short tons. This estimate was made in December, based on the January-September record, with adjustments during the last three months to account for losses from strikes

and from curtailed power in the Northwest. Strikes at Reynolds' Jones Mills plant in August and September, and later at Alcoa's plants at Alcoa, Tenn., and Badin, N. C., for about two months starting mid-October cut total production to levels substantially below those in the comparable 1948 periods. There was thus a net drop of about 4% in 1949 compared with the 623,000-ton output of primary in 1948.

Augmenting these primary supplies were an estimated 200,000 tons of secondary production. This represented a 30% reduction from the 287,000-ton secondary output in 1948. This drop reflects the precipitous fall in aluminum scrap imports from 72,000 tons in 1948 to an estimated 36,000 tons in 1949.

Imports of metal and semi-manufactures in 1949 amounted to an estimated 80,000 short tons, assuming that the rate increased slightly during the last two months as a result of the strike.

Total supplies of primary, secondary and imports were thus about 880,000 tons in 1949, compared with 1,000,000 tons in 1948.

Shipments of products in 1949 are estimated at 590,000 tons of wrought products and 150,000 tons of castings—a total of 740,000 tons. With adjustments for increases in stocks of ingot, and assuming that consumers' stocks were decreased rather than increased, it would appear that some primary metal was added to the Government stockpile during the year.

Domestic production of bauxite during the first 9 months dropped 27%, from 1,118,000 long tons in 1948 to 816,000 long tons in 1949. A major factor in this drop was the strike of workers at mines of the Reynolds Mining Corp., which for almost two months curtailed operations of the largest domestic producer. Imports for the first 9 months of 1,821,000 long tons were slightly higher than the 1,812,000 long tons for the same 1948 period. Shipments brought in during the third quarter, 705,000 long tons, were an all-time quarterly record.

Plant Operations Briefed

As announced late in 1948, Alcoa closed its outdated reduction plant at Niagara Falls at the end of February, after 54 years of operation. Contrary to plans announced a year ago, the Massena plant continued full-scale operations throughout the year, inasmuch as final sale of the St. Lawrence, N. Y., Government plant was not completed as had been anticipated. Alcoa had planned to close two of the three potlines in the Massena plant and open two of the three potlines in the St. Lawrence plant when its sale to them was completed.

Strikes Curtail Output

The Alcoa, Tenn., and Badin, N. C., plants operated continuously until the strike of the United Steelworkers, CIO, shut them down from Oct. 17 to Dec. 7. This meant little if any output the rest of the year because of the time needed to start potline operations. This same strike stopped operations at the Mobile, Ala., alumina plant, at five fabricating plants, and at the Bauxite, Ark., mining operation.

Operations at the Vancouver plant were curtailed 20% from Oct. 25 to Dec. 12 because of power shortages in the Northwest. Operations at Kaiser's Mead plant and Reynolds' Longview and Troutdale plants were also curtailed by the same power cutoff.

Construction on Alcoa's new reduction plant at Point Comfort, Tex., proceeded on schedule. Plans called for production early in January, 1950. Its three-potline capacity will be 57,000 tons per year.

The large mill of Alcoa at Davenport, Iowa, got really rolling in 1949. By March, 1949, installation of hot-mill facilities was finished, permitting complete fabrication of sheet and plate from cast ingots. By using 7,200-lb. ingots, this plant can now roll plate in widths up to 120 in. and in lengths up to 720 in., or it can produce finished plate up to 4 in. thick. These larger sheet and plate sizes will encourage more extensive use of aluminum rolled products for railroad tank cars and other large structures.

Alcoa also completed a modern 10 million pound-per-year fluoride chemicals plant at East St. Louis, Ill., and started construction of a new rod, wire, and cable mill at Vancouver, Wash.

Reynolds put a third potline into use at their Jones Mills plant in April, but this line was not reopened in the fall after the strike. It is expected that the Lake Catharine power development of Arkansas Power and Light Co. will make power available for a third potline at Jones Mills in mid-February, 1950, with more power for the fourth line available a month later.

In October, Reynolds announced the start of an $8,000,000 expansion program to its plant at Listerhill, Ala., including new Lewis foil mills, a new cable plant for production of ACSR for electric conductors, and additional rod-rolling facilities, some of which were moved from plants in Louisville, Ky.

Kaiser started operations at its Newark, Ohio, rod, bar, and cable plant early in July. Initial output of ACSR electric conductor was scheduled for rural electrification projects in Texas, California and Oregon. The War Assets Administration announced in June that this plant, previously under lease to the Permanente Metals Corp., had been sold to them for $4,500,000.

In midsummer War Assets Administration also announced the sale to Permanente of the Mead reduction plant, Trentwood rolling mill, and Baton Rouge alumina plant for $36,000,000. These plants had previously been under lease to Permanente.

Kaiser completed construction of its new foil mill, transferred from Germany, and started production in March. Valued at $1.5 million, the mill has a capacity of about 5 million pounds of foil.

Stockpiling Plans

Washington reports[1] early in September mentioned that stockpiling needs for aluminum ingot for fiscal 1950 were indicated at that time by the Munitions Board to be 60,000,000 lb., a mere 5% of 1949 output. General Services Administration reported that Kaiser would have the right to supply 40% of these needs under provisions of their plant purchase contract with War Assets Administration, and Reynolds the other 60%. Kaiser's plant purchase contract further provides permission to make payments in aluminum for 25 years. Late in the year the Munitions Board announced that primary aluminum pig metal had been added to the list of strategic and critical stockpile materials. No purchases were planned for fiscal 1950, however, since stockpile requirements for the metal were expected to be met by deliveries from the General Services Administration.

Building Uses Expand

Use of aluminum for building products led the field in 1949, but notable gains were scored by transportation and power transmission uses. The 1948 and 1949 patterns of the metal as shown by shipments

[1]Wall Street Journal, Sept. 3, 1949.

of ingot and mill products by the three producers of primary aluminum, weighted according to their relative importance as a metal producer, are as follows:

	Per Cent of Total 1949	1948
Building Products	27	25
Transportation	17	14
Power Transmission	9	4
Household Appliances	6	9
Cooking Utensils	6	8
Machinery	4	4
To fabricators for processing, plus other uses.	31	36
	100	100

A breakdown of aluminum usage in the transportation field is shown by the following data representing averages of two primary producers —the figures being percentages of total shipments for transportation usage only in 1949 compared with 1948: For aircraft, 52% in 1949 and 30% in 1948; motor vehicles, 43% and 66%; railroad equipment, 3% and 3%; boats, 2% and 1%. Impact of the heavier military aircraft program in 1949 is shown by the above figures.

Among interesting new aluminum products introduced during 1949 were forged truck and trailer wheels, extruded floor systems for trucks and trailers, forged aircraft bearings, criss-cross tread plates, curtain wall construction for office and institutional buildings, and seamless cable sheathing. Previously established aluminum uses which scored important gains in 1949 included architectural applications; industrial roofing sheet; television antennas; grain bins; foil for wrapping, for kitchen use and for food freezing; forgings for diesel locomotives, hand tools, and manhole steps; railroad tank cars; marine construction; street lighting poles and standards; and irrigation pipe.

In contrast with gyratory price movements in most other materials in 1949, prices of primary aluminum ingot held steady throughout the year at 17c. per pound, a figure well below the 1939 20c. level. The relative stability of aluminum prices is undoubtedly a factor in the increasing popularity of the metal.

Foreign Developments

Further news of surveys by the Aluminum Company of Canada for a vast $500,000,000 development in British Columbia were headlined in 1949.[2] With a probable potential of 1,500,000 hp., the project would provide power for producing over 500,000 tons of metal per year—a development much larger than the huge layout at Arvida, Quebec. So vast is the potential undertaking that it will probably take several years for plans to crystallize.

It was also reported that potential power sites for aluminum reduction in the vicinity of Skagway, Alaska, were being surveyed by the Aluminum Company of America.

In Jamaica, Kaiser has purchased property for a loading dock and is exercising Jamaican bauxite options and purchasing additional property. Kaiser has been exploring bauxite deposits there since mid-1948.

ECA reported that $11,000,000 had been earmarked for a bauxite-producing project in Jamaica. Reynolds Jamaica Mines, Ltd., will develop and operate the mines.

World production of aluminum was estimated at $1,265,000 metric tons (about 1,400,000 short tons) in 1948 by the Bureau of Mines. The U. S. S. R. output was estimated at 140,000 metric tons (about 154,000 short tons). This amounts to a fourth as much as the United States produced in 1948 and compares with the Bureau's estimate of 105,000 metric tons for U. S. S. R. output in 1946.

[2]The Oregonian, July 31, 1949, and American Metal Market, July 12, 1949.

Magnesium

RATHER SUBSTANTIAL GAINS were scored by magnesium in 1949. Although primary production gained only slightly—from 10,000 tons in 1948 to 11,500 tons in 1949—shipments of wrought products were up almost 50%, based on the January-October record (6,870,000 lb. in 1949 compared with 4,605,000 lb. in the same 1948 period). Shipments of castings showed a 16% rise in the 10-month period—from 6,732,000 lb. in 1948 to 7,782,000 lb. in 1949.

Primary metal supplies were augmented by secondary magnesium, probably amounting to at least 8,000 or 9,000 tons. Output of secondary totaled 7,800 tons in 1948 and 9,500 tons in 1947. In melting down scrap for making secondary metal or for use in other alloys (principally aluminum-base), old and new scrap are used, overall, in roughly equal amounts. In 1948 the percentages of old and new, respectively, were 57 and 43%.

Increasing demands for magnesium wrought products are necessitating expansion of rolling facilities. Dow has plans to expand rolling mill capacity, and Eastern Stainless Steel, and Brooks and Perkins, Inc., are undertaking rolling of magnesium sheet, the latter in a new plant now building in the Detroit area that will have a capacity of 500,000 lb. of sheet monthly.

Undoubtedly a large factor in the boosted demand for wrought products is the larger amount now going into aircraft. Over 10,000 lb. of magnesium sheet goes into a B-36; and extrusions are used to the extent of 2,000 lb. in the Douglas C-124 Globemaster, and 2,257 lb. in the airframe of the Chance-Vought F7U. Substantial amounts of sheet have also been used by the printing industry for photo-engraving, and more and more magnesium extrusions are going into truck bodies and trailers. Principal fields of use for magnesium in 1948, as reported by one of the fabricators were, in the order of importance: aircraft, portable and pneumatic tools, household appliances and yard tools, and textile machinery. These uses accounted for 89% of their shipments of semi-fabricated forms (excluding ingots).

Important metallurgical developments during 1949 included the introduction of a magnesium-zinc-zirconium alloy for high strength extrusions, and a magnesium-cerium-zirconium casting alloy for high temperature use. Magnesium also made news in 1949 through its use in making nodular cast iron—a high-strength, ductile product approaching malleable iron and cast steel in many important properties. Founders attempt to hold magnesium in the finished product to within the range of 0.04 to 0.06%, but must add around 0.3 to 0.5% of the metal in the form of a master alloy to obtain the desired residual contents. Electroplating of magnesium went into commercial usage in 1949 and is expected to expand fields of usefulness.

The World War II magnesium plant at Luckey, Ohio, was revamped to permit its use for production of beryllium. The Brush Beryllium Co. is operating the plant for the Atomic Energy Commission. Production was scheduled to be in full swing by the end of November.

World production of magnesium, shown by countries, was estimated by the Bureau of Mines at 19,000 metric tons for 1948, compared to 19,734 metric tons in 1947.

METALS IN REVIEW

Minor Metals

Statistical picture reveals no general trend. Production, imports, consumption and prices exhibit variation, depending on the commodity.

CHARLES WHITE MERRILL,
Chief, Metal Economics Branch, Bureau of Mines

COMPARISON OF 1949 with 1948 reveals no general trend in the statistical records for the minor metals. Production of beryllium, cadmium, platinum, and titanium metal was up, but output of antimony, arsenic, cobalt ore and mercury dropped. Production peaks were established for beryl, ilmenite, and titanium metal. Consumption was more generally downward, with only beryllium, bismuth, and titanium metal showing a definite uptrend.

The import record also was mixed with increases reported for beryl, bismuth, mercury, and ilmenite, but antimony, arsenic, cadmium, cobalt and palladium entered the country in smaller quantities in 1949 than in 1948. Imports of ilmenite and mercury reached unprecedented levels. Price advances occurred for beryl, which reached an all-time high, and cobalt, while declines were registered for antimony, arsenic, platinum, ilmenite, and rutile. Bismuth and cadmium prices remained unchanged.

The stock positions for most of the minor metals were obscured by the secrecy surrounding the Government's strategic stockpiling program. Most of the minor metals are strategic stockpile items.

Cobalt

HUBERT W. DAVIS, Commodity Specialist, Bureau of Mines

CONSUMPTION OF COBALT continued at a high rate in the first nine months of 1949, chiefly because of greater use for high-speed and other steels, high-temperature alloys, and cemented carbides. These gains were offset by smaller uses of cobalt in magnet alloys, alloy hard-facing rods and materials, ground-coat frit, and pigments. Supplies exceeded demand, and stocks held here by suppliers increased substantially.

Production of cobalt metal here was at about the same rate in the first nine months as in the corresponding period of 1948. Imports were up 7%, but sales were down 26%. Output of oxide was 2% greater, but imports and sales declined 64 and 35%, respectively. Production and shipments of cobalt hydrate and salts were greater in the first nine months than in the corresponding period of 1948, but output and shipments of driers were smaller.

Output of cobalt ore in the United States declined moderately, but imports of alloy and ore were down 40%. Usage of alloy and ore was about the same in both periods. Reduction & Refining Co., Kenilworth, N. J., began refining Government-held ore and subgrade metal late in 1949. Calera Mining continued development at the Blackbird mine, Idaho.

Consumption of cobalt by industrial consumers was 3,439,000 lb. in the first nine months of 1949, compared with 3,606,000 lb. in the corresponding period of 1948. Taking 22% of the 1949 total, cast cobalt-chromium-tungsten alloys represented the largest single use for cobalt, and the quantity utilized was 31% greater. Magnet alloys took 21%, but such usage was 25% smaller. High-speed and other steels utilized 19% and 22% more than in the corresponding period of 1948. More cobalt was also used for cemented carbides, but there was substantial declines in usage for alloy hard-facing rods and materials, ground-coat frit for porcelain enamel, and pigments. Cobalt salts and driers were used at a rate about 6% less than in 1948.

Consumption of cobalt contained in alloy and ore by refiners and processors was 1,971,000 lb. in the first nine months of 1949, compared with 2,033,000 lb. in the corresponding period of 1948. Consumption of cobalt intermediates by refiners and processors was 508,000 lb. in the first nine months, compared with 477,000 lb. in the corresponding period of 1948.

Bethlehem Steel Co. was again the only producer of domestic commercial cobalt ore in 1949; the nine-months output was 8% less than in the corresponding period of 1948.

Imports of cobalt in the first nine months were 15% smaller than in the corresponding period of 1948. Belgian Congo shipped 1,646 short tons of alloy, containing 1,468,521 lb. of cobalt and 2,409,889 lb. (gross weight) of metal, and Belgium 1,429,900 lb. (gross weight) of metal and 210,000 lb. of oxide containing 149,100 lb. of oxide.

Reported exports during the first nine months included 156,473 lb. (gross weight) of metal, plus scrap and some oxide and salts.

Effective April 1, 1949, the price of cobalt metal (97-99%, in kegs of 550 lb.) was raised to $1.80 a lb. delivered east of Chicago; metallurgical-grade oxide was also raised to $1.80 a lb. of contained cobalt, f.o.b. Niagara Falls, N. Y., and ceramic-grade oxide to $1.38 a lb. (gross weight) east of Mississippi River. The former prices of the three commodities were $1.65, $1.65, and $1.27 a lb., respectively.

Antimony

SAMUEL A. GUSTAVSON,
Commodity Specialist, Bureau of Mines

THE NEW SUPPLY of primary antimony produced by domestic mines and imported in 1949 declined considerably from that of 1948, principally because of smaller demand. Production of antimony in antimonial lead from gold, silver,

and lead ores at primary refineries was about the same (2,190 short tons). That from secondary sources was about 14% less than in 1948. Refiners and consumers, to reduce high-cost inventories in expectation of a declining market, purchased little domestic ore. Mining virtually ceased later in the year.

Domestic mines produced (in antimony contained) 1,630 short tons during 1949, a decrease of 75% from 6,489 tons in 1948. Bradley Mining Co. was again the principal producer. This company stopped mining antimony April 1, began treating stockpiled ore in its new smelter.

Secondary recovery of antimony in 1949 was about 18,500 tons (21,592 tons in 1948).

General imports in 1949 (contained antimony) were estimated at 2,320 tons of regulus, 56 tons in needle or liquated antimony, and 8,000 tons in ore, for a total of 10,376 tons, compared with a total of 17,321 tons in 1948.

Seven years of Government control ended with the revocation of Allocation Order M-112 on March 25. Export-license requirements were retained.

The quoted price for domestically produced metal by the major producer was 38.5c. per lb. for carlots, 99.5%, f.o.b. Laredo, Tex., until Oct. 7, when it was reduced to 32c. Quoted prices for domestic antimony ore and imported ores and metal began to decline early in the year. Nominal quotations for Chinese metal, 99%, opened the year at 38.5c. per lb., carlots, duty-free, delivered New York, and closed the year at 26c. Antimony ore, 60% grade, opened at $5.20 per unit of contained antimony, and purchases were made under $2.50 near the year end.

Arsenic

JACK W. CLARK, Commodity Specialist, Bureau of Mines

GREATLY REDUCED DEMAND for white arsenic in the production of insecticides, owing to competition from synthetic preparations, resulted in marked curtailment of domestic production and imports during 1949. Smelter output and producers' shipments of refined and crude white arsenic both slumped about 30% below 1948 totals. Conversely, producers' year-end stocks rose nearly 30% above those of the equivalent 1948 period. Estimated imports for 1949 totaled about 4,000 tons as compared to 9,336 a year earlier and were at the lowest level recorded since 1922.

Refined white arsenic in carlots, delivered, was quoted at 6c. per lb. until mid-October, when a decline to 5½c. was noted.

Production of calcium arsenate reached an exceptionally low level in 1949 because of preference for benzene hexachloride, DDT and toxaphene in control of cotton insects.

Cadmium

RICHARD H. MOTE, Commodity Specialist, Bureau of Mines

DESPITE A SLIGHT DROP in domestic slab-zinc production, which generally presages a parallel decline in recovery byproduct cadmium, the output of cadmium metal in the United States in 1949 rose approximately 5% to an estimated 8,000,000 lb. Strikes prevented a greater gain.

A small quantity of secondary cadmium metal was recovered from old bearings and other alloy scrap. Production of cadmium compounds in 1949 is expected to remain virtually unchanged from the 1948 output.

Quantitative data on consumption are unavailable, but a relatively unchanged use pattern is indicated. The metal continued to be consumed in large quantities for electroplating iron and steel and in making bearing alloys and pigments.

Total imports of metallic cadmium and of cadmium in flue dust in 1949, based on data for the first 10 months, were slightly lower than in 1948. Imports of cadmium-bearing flue dust, virtually all from Mexico, were about 14% below the 1948 rate. Imports of metallic cadmium were nearly 17 times greater than the total imported in 1948 and the largest quantity recorded since 1939. Canada supplied over 45% of the metal imported in 1949, about 35% came from Belgium-Luxembourg, 13% from Japan, 5% from Australia, and over 1% from Peru.

The quoted New York price of $2 per lb. for commercial sticks and $2.05 for patented shapes, established Nov. 15, 1948, remained unchanged throughout 1949.

Bismuth

JACK W. CLARK, Commodity Specialist, Bureau of Mines

DOMESTIC OUTPUT of metallic bismuth in 1949 was essentially the same as for 1948. The supply of new metal was inadequate to meet demand and producers' stocks by the year-end had fallen 35% below inventories for the same period in 1948.

Imports for 10 months in 1949 rose to 412,972 lb. compared with 299,824 lb. in the entire year 1948.

One major supplier of refined bismuth indicated difficulty in obtaining enough metal. In contrast, bismuth pharmaceuticals appeared readily available. Bismuth metal was actively sought for stockpiling.

Interest in the low-melting bismuth alloys continued at a high pitch with many applications being developed. The low neutron absorption of the metal suggests its use in nuclear-energy apparatus.

The New York price of refined bismuth metal in ton lots was quoted throughout 1949 at $2 per pound. Prices of bismuth pharmaceuticals were similarly stable.

Mercury

HELENA M. MEYER, Commodity Specialist, Bureau of Mines

MERCURY AVAILABLE FOR CONSUMPTION in 1949 continued much in excess of industrial needs here and abroad. In the United States the industry was featured by imports that were greater than ever before, the gain being many times the drop in domestic production. The major part of the metal entering the country was for strategic stockpiling and thus did not overhang the market. The fact that greater quantities than desired were available for shipment to the United States and that the quantities entered and already here were large in relation to

needs, however, kept the market depressed. The price, which was slightly above the average for 1948, trended downward from the beginning to the year end. Except for several years in the nineteen twenties, domestic production was at the lowest rate since 1850, despite the fact that the 1949 total was much larger than anticipated. Consumption in 1949 probably was 20% under the high peace-time rate maintained in 1948.

Consumption of mercury in the first nine months of 1949 (26,000 flasks) was 26% below the high peacetime rate maintained in the first three quarters of 1948, but the opening of a new mercury boiler plant at Portsmouth, N. H., in the final quarter, may help bring the annual total to within 20% of that for 1948. The chief declines in the first three quarters of 1949 in relation to 1948 were in agricultural use, which had gained markedly for several years but dropped almost one-half in 1949, and in the use of mercury as a catalyst and in electrolytic preparation of chlorine and caustic soda, which together declined one-fourth. No new chlorine and caustic-soda plants were built in 1949 as in 1948, but three new mercury boiler plants went into operation at Hartford, Conn., Pittsfield, Mass., and Portsmouth, N. H.

The New Mercury Boilers

The first-named was a new installation to replace a smaller unit that had been in operation many years. The new and larger replacement unit used some new metal in addition to what was already in service. The second plant used only mercury taken from the recently closed Schenectady, N. Y., boiler, but the third evidently used only new metal.

Consumption of mercury in the new cell did not reach expectations in 1949 but is expected to make a small gain in 1950. Electrical apparatus (including the new cell) rose 18% in the first nine months, compared with the like period in 1948, establishing one of the few gains. Industrial and control instruments fell 13%.

According to the Department of Commerce, general imports of mercury were 95,358 flasks in the first 10 months of 1949, or one-third more in 10 months than in all of 1945, the previous peak year. A very large part of the metal imported was purchased in Europe by the ECA for stockpiling. Italy led all other countries as a supplier in 1949, accounting in January-October for 86,049 flasks, while Mexico sent 3,241 flasks, Japan 2,913, Yugoslavia 1,913, Spain 1,236, and Canada 6.

Exports for 10 months of 1949 amounted to 353 flasks and reexports totaled 760 flasks.

The downtrend in mercury quotations generally in progress from March, 1945, was reversed at the end of 1948, when the sharp markup took place in the Spanish-Italian cartel, Mercurio Europeo. The downtrend was resumed immediately and continued virtually without interruption through 1949. The average of slightly over $79 a flask in 1949 was 4% above 1948. The price in London was £18 5s. 0d. in January, 1949, moved to £18 10s. 0d. in February, and remained at that level until the pound was devalued in mid-September, after which the price was £26 5s. 0d.

Beryllium

JACK W. CLARK, Commodity Specialist, Bureau of Mines

RECOGNITION OF THE IMPORTANCE of beryllium in atomic energy applications, combined with the purchase of beryl ore by governments, is believed to have been the driving force behind the rise in ore prices to record peaks in 1949.

The long-term outlook for beryl-ore supply continued discouraging, but imports and domestic output reached a level sufficient to alleviate temporarily the concern felt by consumers since the war.

Domestic beryl production totaled nearly 475 tons, an all-time high and almost five times the 1948 output.

Beryl imports for 1949 are estimated at 3,000 tons, over double those of the previous year. Brazil was the principal shipper with 2,190 tons in the first 10 months. Production of beryl in Morocco (22 tons) was the first on record, most of it going to France. Beryl was actively sought for the Government stockpile, to which were also transferred, late in 1949, the remaining beryl stocks held by the Office of Metals Reserve.

The fluorescent lamp industry ceased to use beryllium phosphors, beginning July 1, 1949, employing instead activated calcium halophosphates. Loss of this market was compensated by growing needs for beryllium in the nuclear energy program. Late in the year, Brush Beryllium Co. started large-scale production of beryllium metal and its compounds for Atomic Energy Commission at the new plant at Luckey, Ohio.

Published quotations for domestic beryl ore, 10-12% BeO, f.o.b. mine, were $24-$26 per short-ton unit in January, changing successively in mid-January to $26-$28, late January $26-$30, April $25-30, June $25-$35, August $30-$35, and October $35 (Colorado), $25-$30 (North Carolina). Similarly, imported ore, c.i.f. U. S. ports, ranged from $22-$23 in early January to $26-$28 in late January, $25-$30 in August and $26-30 in October. Beryllium-copper master alloy, 4% Be, was quoted early in the year at $20.50 per lb. of beryllium, increased to $24.50 in mid-January and remained unchanged thereafter.

Platinum—Group Metals

HUBERT W. DAVIS, Commodity Specialist, Bureau of Mines

THE DEMAND FOR PLATINUM in 1949 continued a downward trend that has persisted for four consecutive years, and the retail price dropped from $96 an ounce to $72. Demand for palladium was also at a much lower level, but the price remained static at $24 an ounce. Demand for iridium, osmium, and rhodium was likewise smaller, but that of ruthenium was slightly greater. Throughout 1949 the quotations on rhodium and osmium remained at $125 and $100 an ounce, respectively, and the price of iridium declined $10 an ounce to $100-$105, but that of ruthenium dropped $24 an ounce to $72. Imports of platinum during the first nine months were at about the same rate as in the corresponding period of 1948, but there was a big decline in receipts of palladium. Receipts of the latter from the U. S. S. R.—the

chief source of the 1948 imports—were conspicuous by their absence in 1949.

Refining of platinum in the United States during the first nine months was at a rate slightly higher than in the corresponding period of 1948 and equal to only about 47% of the demand, which declined 16%. Recovery by domestic refiners was supplemented by imports of metal, chiefly from Canada and the United Kingdom. The jewelry trade was again by far the largest customer. Total sales to domestic consumers (113,000 oz.) in the first nine months were 17% less than in the corresponding period of 1948. Imports of refined platinum were 71,317 oz. and export sales were 11,586 oz. during the nine months.

Although refining of palladium in the United States from January to October inclusive was at a higher rate than in 1948, it was inadequate for the demand, although it was much smaller. The deficiency was met partly by imports of 50,844 oz. of metal, chiefly from Canada and Switzerland, and partly by withdrawals from stock of refiners and dealers. The electrical industry was again the largest buyer. Total sales to domestic consumers and for export were 101,200 oz. in the nine months, a loss of 26% from the corresponding period of 1948.

Refining, sales, and imports of the other platinum-group metals—iridium, osmium, rhodium, and ruthenium—were comparatively small. Refining of each metal was at a higher rate in 1949 than in 1948. Imports of rhodium and ruthenium were also higher, but much less iridium and osmium were imported in the first nine months than in the corresponding period of 1948. Sales of iridium, osmium, and rhodium were smaller, but those of ruthenium were slightly larger than in 1948.

Titanium

HELENA M. MEYER, Commodity Specialist, Bureau of Mines

IN 1949, AS IN 1948, widespread interest and research in connection with the production of titanium metal and alloys featured the titanium industry. The problem of producing metal at a price low enough to attract large-scale use remained to be solved, but more than one authority predicted that titanium and titanium alloys would become primary structural materials within 10 years. The speed with which this metal is expected to attain tonnage proportions is predicated largely on the unprecedented amount of money and effort being spent. Titanium was produced commercially in 1949 for the second successive year and on an increasing scale. One pilot plant operated at approximately 100 lb. a day throughout the year, and a second somewhat larger pilot plant started up near the year end. The purity of the metal is 99.5% plus.

Pilot Plant Metal

Dominion Magnesium, Ltd., is producing titanium metal at its Government-built pilot plant at Haley, Ont., using the Pidgeon-Rostrom process, claimed to be much cheaper than other processes. Ingots of 25 to 200 lb. of metal of 99.5-99.6% purity are being produced occasionally for Government experimental work.

Development of the Allard Lake, Quebec, ilmenite property of the Kennecott Copper Corp. and New Jersey Zinc Co. continued according to schedule. The immediate production objective is 700 tons daily of slag containing over 70% TiO_2, from 1,500 tons of ore. Other units may be built if conditions warrant. The slag will be produced in an electric furnace, to be built at Sorel, and will be shipped to the United States for further treatment.

The domestic titanium pigments industry, like most others, was adversely affected by the drop in general industrial activity beginning in the second, and lasting through much of the third, quarter of 1949. The pigments continued to hold a favorable position in relation to other products. The year as a whole witnessed the establishment of some new records.

Supplies of ilmenite, chief source of titanium, were record-breaking in 1949 because domestic production reached unprecedented heights and because imports likewise were higher than ever before. Consumption for all purposes again failed to absorb supplies from all sources with the result that stocks at the year end were the highest on record. Rutile stocks likewise rose.

Domestic output of ilmenite (399,000 short tons containing 191,000 tons TiO_2) was higher than ever before, owing in part to the fact that the DuPont property at Starke, Fla., became a producer in March. The Tahawus property of National Lead Co. in the Adirondack Mountains, New York, continued to produce at virtually the record rate set in 1948. Other producers in 1949 were: Rutile Mining Co., in Florida, near Jacksonille; Riz Mineral Co., near Vero Beach, Fla.; Yadkin Mica and Ilmenite Co., Finley, N. C.; Calco Chemical Division, American Cyanamid Co., Piney River, and American Rutile Corp., Roseland, both in Virginia; and Ferro-Titan Minerals Co., Los Angeles County, Calif. Shipments of ilmenite totaled 388,500 tons containing 186,000 tons TiO_2, and were 2% higher than in 1948, the previous top year.

Imports of ilmenite for January to October, inclusive, were 295,000 short tons, an increase of 29% over the 228,000 tons received in the first 10 months of 1948. India as usual dominated the list of suppliers by a wide margin, sending 277,400 tons of the total for January-October, 1949.

Estimated production of rutile in 1949 was 11,600 short tons, averaging 10,350 tons TiO_2, a gain of 57% over 1948. Included is a quantity of mixed product containing altered ilmenite, leucoxene, and rutile, which is produced at one operation and used in the manufacture of titanium oxide. Four companies produced rutile in 1949.

Imports of rutile, all from Australia, were only 2,750 short tons in the first 10 months, or little more than one-third of receipts in the same period of 1948.

Expansion Checked

The average quotation per gross ton for ilmenite containing 56-59% TiO_2, f.o.b. Atlantic seaboard, dropped from $18-$20, according to grade and impurities, on Jan. 1 to $16-$18 in early October, to $15-$17 late in that month, and further to $14-$16 in the first half of November. Quotations were given as nominal. The drop in prices is said to have prevented some proposed expansion in domestic production and to have threatened some active operations.

Nominal quotations for rutile, guaranteed minimum 94% concentrate, after continuing at 8-10 cents a pound for a number of years, fell to 6-8 cents in December 1948 and to 4-6 cents in May 1949, at which level they remained for the rest of the year.

METALS IN REVIEW

Ferro-Alloy Metals

Solution of manganese supply problem is sought while output of other metals falls, as demand for corresponding alloy steels declines.

CHARLES WHITE MERRILL,
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PRODUCTION OF FERRO-ALLOYS in 1949 is estimated at 1,390,000 short tons, compared with 1,892,521 tons in 1948, a drop of 27%. Thus it followed closely the trend in alloy-steel production, which was estimated to be 23% below the 1948 level. In comparison, the estimated production of steel during the year was only 15% below the 1948 level.

Lower demands for alloy steels were reflected in lower production of all important types except manganese steels, which experienced a slight increase. Consumption of both metallurgical chromite and nickel dropped sharply in 1949, as requirements for stainless steel and other nickel alloys decreased. Production of ferromanganese fell off at about the decrease in the steel-production rate; but imports of ferro continued high, and consumption of this material exceeded production. Substantial drops in output of high-speed steels were mainly responsible for decreased consumption of tungsten and molybdenum.

Prices of the ferro-alloying raw materials followed no definite pattern in 1949; manganese and molybdenum prices advanced, those of tungsten and chromite declined, and the price of nickel remained unchanged.

An important change in sources of manganese and chromite developed early in 1949, when the U. S. S. R. became a relatively small supplier of these materials after having been the leading shipper. China continued the leading source of supply of tungsten for the United States in spite of its internal disturbances.

Manganese

NORWOOD B. MELCHER, Commodity Specialist, Bureau of Mines

THE CRITICAL SHORTAGE of manganese ore evident at the close of 1948 was intensified in the first quarter of 1949 by a virtual embargo on exports of manganese ore from Russia to the United States. The Soviet Union, which had supplied 34% of the imports in 1948, furnished only 6% in the first ten months of 1949, most of which was received in the first quarter. No explanation came from official Russian sources regarding the sharp drop. It seemed clear that the United States could no longer rely on Russia as a dependable source and that, for the long range, sources adequate to meet domestic requirements from other areas would have to be made available.

The seriousness of the problem was recognized by the Government, and in March 1949 the National Security Resources Board, at the President's request, established the Interdepartmental Manganese Coordination Committee, with James Boyd, Bureau of Mines Director, as chairman. This committee was assigned the duty of coordinating efforts of industry and Government to attain a satisfactory balance between total domestic requirements and supplies. Most of the programs begun in 1949 will not be effective for several years, but some that were already underway Jan. 1, 1949, showed substantial results by the second half.

Completion of a program begun in 1948 to supply railroad cars to the Union of South Africa resulted in a substantial increase in exports to the United States in 1949. Shipments were expected to exceed 300,000 short tons, compared with only 217,000 tons in 1948. Similarly, shipments from India are expected to nearly double the 1948 total of 216,000 short tons. India was the largest single supplier to the United States in 1949, furnishing 27% in the first 10 months. Exports to the United States from Gold Coast also increased in 1949, reaching 330,000 short tons of ore. In addition, imports of ferromanganese made from Gold Coast ore were received from Norway and Canada equivalent to about 120,000 tons of ore. Thus, in terms of ore equivalent, Gold Coast was the largest source in 1949, furnishing about 450,000 short tons.

Inadequate transportation facilities in Brazil held the 1949 shipments of ore to about the 1948 level of 144,000 tons. Cuba and Mexico each shipped about 4% of the 1949 total, and small shipments (3% in all) were made from Angola, Belgian Congo, Chile, France, French Morocco, the Philippines, Portuguese Asia (Goa), United Kingdom and Liberia. Imports of manganese ore during the first 10 months totaled 1,201,240 short tons; of this, 61,319 tons was battery-grade.

Domestic production of manganese ore in 1949 dropped slightly from that of the previous year, due largely to mechanical problems, and is estimated at 115,000 short tons. As in 1948, most of the metallurgical ore and all of the battery-grade originated in Montana. The metallurgical material consisted of high-grade nodules produced by the Anaconda company.

Shipments of ferruginous manganese ore and manganiferous iron ore containing 5 to 35% manganese during 1949 is estimated at 1 million short tons. Most of this material originated on the Cuyuna range in Minnesota.

Ferromanganese production dropped from 647,617 short tons in 1948 to an estimated 550,000 in 1949. This resulted from a lower level of steel production and the steel strike in October and November. Consumption of ferro exceeded production in 1949; this was made

possible by importing more than 60,000 tons during the year. United States consumption of manganese ore during 1949 was estimated at 1,200,000 short tons, a decrease of 22% from 1948. Consumption of ferro, however, decreased approximately 15%.

Year-end stocks of manganese ore in consumers' yards seemed likely to surpass by a wide margin those held at the beginning of 1949. Inventories of metallurgical ore amounted to 596,405 net tons on Dec. 31, 1948 and 592,585 tons on Sept. 30.

Prices of both manganese ores and alloys increased in 1949 over 1948. Standard manganese ore containing 48% Mn, duty-paid, c.i.f. United States ports, rose from about 70c. per long-ton unit on Jan. 1 to about 82c. in November; standard ferro rose from $160 per gross ton of alloy in carlots to $172 per ton in November. The import tariff on manganese continued at the 1948 rate of ¼c. per lb. of contained manganese throughout 1949.

Tungsten

HUBERT W. DAVIS, Commodity Specialist, Bureau of Mines

A SUBSTANTIAL DECLINE in the 1949 outputs of "18-4-1" type (18% tungsten, 4% chromium, and 1% vanadium) and "6-6" (6% tungsten and 6% molybdenum) or molybdenum-type high-speed steels, a smaller drop in production of tungsten powder, and a decrease in exports of ferrotungsten were largely responsible for a 28% loss in consumption of tungsten concentrates in the first nine months of 1949, compared with the corresponding period of 1948. Usage of concentrates was at a quarterly rate of 2,150 tons during the first half but dipped to 317 tons in the third quarter. To conform to the lessened demand, which was accompanied by a substantial drop in price, some domestic mines suspended operations, and the production rates at most of the others were contracted. As a consequence, domestic output and shipments, as well as receipts of foreign ore and concentrates, declined substantially in 1949.

Production of concentrates in the United States is expected to approximate 3,000 short tons (60% WO_3 basis) in 1949, a 29% drop from 1948. Shipments from domestic mines are estimated at 2,900 tons in 1949, a 28% decrease from 1948. The decline resulted chiefly from suspension of operation on June 25 by the Nevada-Massachusetts Co. and from reduced operating schedules by most of the other producers. Climax Molybdenum Co., in Colorado, Nevada-Massachusetts Co., in Nevada, Tungsten Mining Corp., in North Carolina, and U. S. Vanadium Corp., in California, accounted for about 80% of the total concentrates produced in 1949. Tungsten Mining Corp. was the largest producer.

General imports (receipts) of tungsten ores and concentrates into the United States were 7,351 short tons (60% WO_3 basis) during the first 10 months of 1949 (10,259 tons during the entire year 1948). These quantities represent ores and concentrates received in the United States, irrespective of final disposition; about 45% of the 1949 imports entered bonded warehouses. China (5,136 tons), Bolivia (938 tons), Siam (525 tons), and Korea (339 tons) supplied 94% of the 1949 total.

Imports of ores and concentrate for consumption were 6,322 short tons (60% WO_3 basis) during the first 10 months of 1949 (7,961 tons during the entire year 1948). The quantities represent ores and concentrates on which the duty has been paid and concentrates received duty-free for U. S. Government account. China (4,743 tons), Korea (484 tons), and Siam (324 tons) supplied 88% of the 1949 total. Imports for consumption in the first 10 months included 3,562 tons from China for the account of this Government. In the first 10 months of 1949, 434 tons (60% WO_3 basis) of ores and concentrates was withdrawn from warehouses for smelting, refining, and export (972 tons in the entire year 1948), and 856 tons (gross weight) was re-exported (391 tons in 1948).

Exports of tungsten ores and concentrates in the first 10 months of 1949 were 102 short tons (gross weight).

Consumption of tungsten concentrates in the United States during the first nine months of 1949 was 4,600 short tons (60% WO_3 basis) compared with 6,400 tons in the corresponding period of 1948.

According to *E&MJ Metal and Mineral Markets*, quotations on imported tungsten ores and concentrates declined uninterruptedly from $24.50-$25 a short-ton unit of WO_3, duty paid, on Jan. 1, 1949, to $18-$19 on Oct. 27, when there was a 50c. advance. Domestic scheelite of good known analysis, in carlots, delivered was quoted at $28.50 a unit throughout 1949.

Chromite

NORWOOD B. MELCHER, Commodity Specialist, Bureau of Mines

EXCESS OF CHROMITE SUPPLIES over consumption evident in 1948 continued throughout 1949. Imports were nearly twice the consumption rate and are estimated to have totaled 1,200,000 short tons. Receipts decreased 22% from 1948 almost entirely as a result of a precipitous drop in the tonnage brought from U. S. S. R., which paralleled closely the decline in imports of manganese ore from that country. Receipts from the Soviet Union in 1949 are estimated at 100,000 short tons, compared with 394,000 during 1948. Of the chromite received in the first 10 months, the Philippines were the largest supplier, furnishing 24%, virtually all of refractory grade; Turkey, shipping metallurgical grade, supplied 24%, although total receipts were several thousand tons less than those from the Philippines. South Africa, supplier of United States' requirements of chemical-grade chromite, shipped 211,460 net tons, or 20% of the first 10 months' receipts. The Soviet Union, making intermittent shipments of metallurgical chromite, furnished 96,805 short tons, or 9%; Cuba 83,976 tons, or 8%, mostly refractory; Southern Rhodesia 75,132 tons (7%), mostly metallurgical, and New Caledonia (metallurgical) 57,184 tons, or 5%. Relatively small shipments came from British West Africa, India and Yugoslavia.

Consumption of all grades in 1949 is estimated at 640,000 net tons, compared with 875,033 tons in 1948, a decrease of 27%. Of the material used in 1949, 270,000 tons, or 42%, was metallurgical; 260,000 tons (41%) was refractory grade; and 110,000 tons (17%) was used in chemical manufacture. Use of metallurgical ore declined noticeably in 1949, dropping to only 46,000 tons in the third quarter. This decline resulted from a decrease in demand for alloy steels which greatly ex-

ceeded the drop in demand for carbon steels. Lessened demand for refractory material was noticeable in the third quarter of the year when steel output showed the greatest decline.

Inventories at consumers' plants Sept. 30, 1949, were larger in all grades than on the same date in 1948. Most of the increase was in the refractory and chemical grades, with only slightly larger stocks of metallurgical. Stocks totaled 730,000 net tons compared with 597,000 in 1948, an increase of 22%. Metallurgical-ore stocks totaled 291,000 tons, compared with 285,000 in 1948; refractory, 312,000 tons (compared with 215,000), and chemical stocks, 127,000 tons (compared with 97,000). The continued excess supply over requirements in 1949 resulted in marked price declines. In the second half, many offers, particularly in the refractory grades, found little response. Prices quoted for metallurgical ore containing 48% Cr_2O_3 and having 3:1 chrome-iron ratio were listed at $39 per gross ton f.o.b. U. S. ports in January and had dropped to $37.50 in November. Ore containing 48% Cr_2O_3 but with no guaranteed chrome-iron ratio dropped from $30 to $28 in the same period. These were nominal prices. Undoubtedly much material was obtained for lower prices in the closing months.

Domestic production of chromite in 1949 was estimated at 300 tons.

Molybdenum

HUBERT W. DAVIS, Commodity Specialist, Bureau of Mines

ALTHOUGH THE STEEL INDUSTRY, which uses about 70% of the molybdenum consumed in the United States, operated at about the same rate in the first nine months of 1949 as in the corresponding period of 1948, demand for molybdenum products by domestic consumers was 31% less. However, whereas the total steel production was about the same in both periods, the outputs of triple-alloy steel containing nickel, chromium and molybdenum and of molybdenum-type (6% molybdenum and 6% tungsten) high-speed steel declined substantially in 1949. The smaller demand in 1949 was also partly the result of unusually large purchases of molybdenum products, made before the price increase effective Jan. 1, 1949. Exports of molybdenum products, however, were up 13%.

As a consequence of an 8% decrease in production of molybdenum products in the first nine months, the quantity of concentrates converted to oxide also declined 8%. Production of concentrates likewise dropped 22%. Colorado was the largest molybdenum-producing state. Exports of molybdenum concentrates were 64% greater in the first nine months than in the corresponding period of 1948. Stock of concentrates held by industry on Sept. 30, 1949, declined 16% from Dec. 31, 1948, but stocks of products held by producers rose 51%.

Domestic production of concentrates was 17,119,400 lb. (contained molybdenum) in the first nine months. Producing states were Colorado, Utah, New Mexico, Arizona, California and Nevada. Arizona alone showed an increase. Production of concentrates at mines operated solely, or almost solely, for molybdenum was 8,845,300 lb. in the first nine months, a decrease of 14%, whereas byproduct concentrates from copper and tungsten operations totaled 8,274,100 lb., a decline of 30%. Byproduct molybdenum represented 48% of the total concentrates produced in the first nine months, compared with 54% in the corresponding period of 1948. Shipments of concentrates in the first nine months comprised 15,965,100 lb. to domestic consumers and 3,315,700 lb. for export, or 3% smaller than in the corresponding period of 1948.

Consumption of concentrates was 16,201,800 lb. (contained molybdenum) in the first nine months, a drop of 8%.

Production of concentrates in the first nine months was less than usage and exports, and stocks held by industry declined to 17,913,000 lbs. (contained molybdenum) on Sept. 30, 1949, from 21,206,000 lb. on Dec. 31, 1948.

Production and shipments of molybdenum products totaled 15,965,100 and 12,148,600 lb. (contained molybdenum) in nine months of 1949, losses of 8 and 29%, respectively. Stocks of products held by producers were 11,363,000 lb. (contained molybdenum) on Sept. 30, 1949, compared with 7,547,000 lb. Dec. 31, 1948.

On Jan. 1, 1949, the price of concentrates containing a minimum of 90% MoS_2 was raised to 54c. a lb. of MoS_2. The former quotation of 45c. had been in effect since 1938.

Nickel

HUBERT W. DAVIS, Commodity Specialist, Bureau of Mines

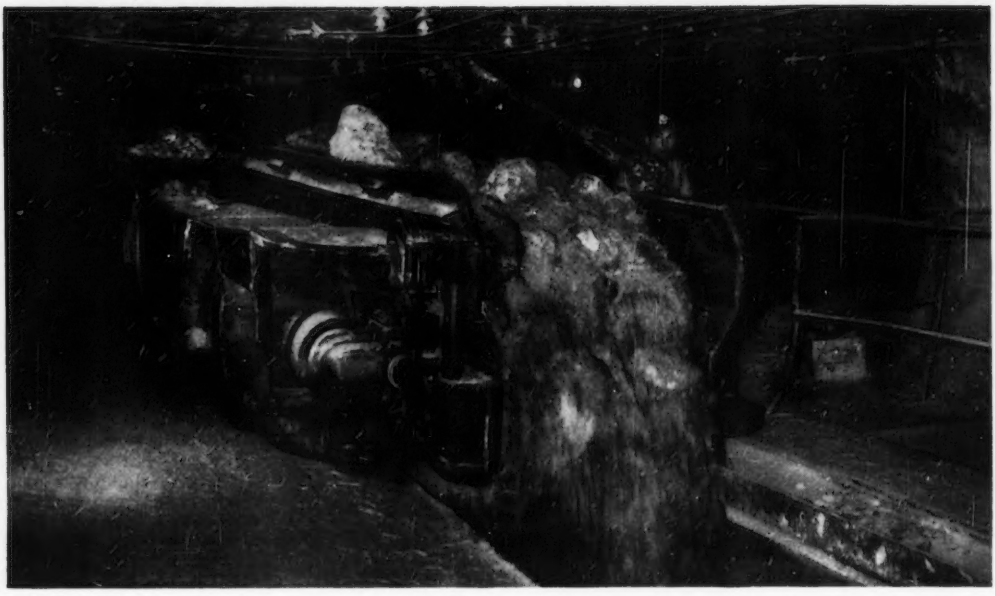
THE TWO-YEAR UPWARD TREND in nickel consumption in the United States was reversed in 1949, partly because of a decline in output of nickel-alloy steels and a smaller loss in production of stainless steel during the first nine months, and partly because of the steel strike in the fourth quarter. Output in Canada was curtailed considerably beginning in mid-1949. Moreover, imports from Canada, the chief source, were 8% less in the first 10 months than in the corresponding period of 1948. However, receipts from Norway and United Kingdom were substantially more.

Nickel production in Canada averaged 11,173 short tons monthly during the first half, but during the third quarter it dropped to an average monthly rate of 9,326 tons. Despite this, total output in the first nine months of 1949 was 95,015 tons, compared with 95,570 in the same period of 1948. Exports during those periods were 98,690 and 99,015 tons, respectively. International Nickel curtailed mining and smelting of nickel ore beginning June 1, but mining, smelting, and refining by Falconbridge remained at a high rate.

Imports in the first 10 months of 1949 (figures for full year 1948 are shown in parentheses) comprised 126,284,766 (143,103,718) lb. of metallic nickel, 15,333,128 (27,708,041) lb. of matte, and 19,747,435 (43,028,224) lb. of oxide and oxide sinter. As heretofore, Canada was the chief source.

Exports consist largely of products made from imported raw materials. During the first 10 months of 1949 (figures for full year 1948 are in parentheses), they comprised 4,763,399 (11,652,796) lb. of alloys and scrap; 1,502,693 (2,705,777) lb. of metallic nickel; 529,100 (747,082) lb. of nickel-chrome electric resistance wire; 850,838 (1,260,330) lb. of nickel silver; and 116,000 (1,500) lb. of ore and concentrates.

Throughout 1949 the contract price to United States buyers for electrolytic nickel in carlots f.o.b. Port Colborne, Ont., remained at 40c. a lb., including duty of 1¼c. a lb.



ABOUT 5 MILLION TONS of potash ore is produced annually at highly mechanized mines in the Carlsbad, N. M., area. Shuttle car above at International Minerals & Chemical Corp. property dumps ore on 800 ft. level of mine.

Non-Metallics

Producers improve mining and concentrating technology to offset higher labor and rail costs. Increased foreign production worries domestic potash producers.

Potash

JACK PIERCE, Executive Secretary, New Mexico Miners and Prospectors Association, Albuquerque, N.M.

THE AMERICAN POTASH INSTITUTE reported that during the first nine months of 1949 domestic and imported deliveries totaled 1,663,262 tons of potash salts containing 894,982 tons of K_2O. Potash for agricultural use in the United States, Canada, Puerto Rico and Hawaii totaled 1,570,560 tons of salts containing 837,816 tons of K_2O, of which 1,242,804 tons were muriate of potash, 166,088 tons were manure salts and 161,668 tons of sulphate of potash and sulphate of potash-magnesia. Deliveries to the chemical industry totaled 78,613 tons of muriate of potash and sulphate of potash containing an equivalent of 48,630 tons of K_2O. Other deliveries amounted to 14,089 tons of salts containing 8,536 tons of K_2O.

During the latter part of 1949 much industry attention was focussed on French potash exports to this country. French mines have been rehabilitated with ERP aid and other assistance. Production has been expanded from 400,000 to 500,000 tons of potash in 1939 to about 750,000 tons at present. Plans call for further increases to about 1,200,000 tons per year. Although French operations are believed to be comparatively inefficient, they enjoy lower labor and operating costs, and cheaper transportation rates to the Eastern Seaboard than domestic producers. The French Potash and Import Co. announced early in November, 1949, a reduction of 30c. a unit in the price of French potash to this country—from 95c. to 65c. per unit.

A strike by UMMSW (CIO) Union called Nov. 19, continuing through 1949, closed the three Carlsbad producers. The United States Potash Co. refinery was not closed by the strike and managed to carry on curtailed production from crude ore in storage.

The Carlsbad area in New Mexico accounts for about 86% of the domestic production. A 1949 progress report of major expansion programs now underway in this area follows:

International Minerals and Chemical Corp. started operating the $1½-million sulphate refinery section in February. A new classifier and bank of flotation cells has been added to the refinery circuit. A third shaft will be sunk through the potash member on the 900-ft. level northwest of the main shaft

to serve as a manway and for ventilation.

Potash Company of America installed 80 new mine cars, three Joy loaders, six Joy shuttle cars, two battery chargers, three Goodman undercutters and bugdusters, eight Jeffrey drills, 20 small Jeffrey ventilation fans, and expanded the power distribution system. On the surface construction has been started on a new pilot plant, and plans are nearly complete for a $1 million plant to produce potassium sulphate and hydrochloric acid.

United States Potash Co. has installed two new Joy loaders, seven Joy shuttle cars, and enlarged underground shops and stockrooms. On the surface the $1-million continuous-flow refinery expansion is nearly complete.

Newcomers in the Carlsbad area include the Duval Texas Sulphur Co., which plans to start a potash development program early in 1950. The 13,000-acre holdings of this company are about midway between the properties of Potash Co. of America and the U. S. Potash Co. The company core-drilled 33 holes prior to February, 1949, and continued drilling during 1949. The Southwest Potash Corp., a subsidiary of American Metals, Ltd., has completed 37 core-drill holes at the company's 19,000-acre holdings about eight miles northwest of the Potash Co. of America mine and plant. Continental Potash Co., which has done considerable work on solution mining on its holdings a few miles west of Potash Co. of America holdings, is inactive at present.

Barite

WALTER B. HESTER, Assistant to General Manager, Baroid Sales Division, National Lead Co.

IN RECENT YEARS, numerous reports published on the barite industry have failed to distinguish between barite ore and the finished product acceptable to industry. The two principal outlets for the finished product are the chemical industry and the well-drilling industry. Material furnished to these industries must have a barium sulphate content of at least 94%, and this is what is properly termed a "finished product."

In Georgia and Tennessee the finished product is separated from residual clay and soil in log-washing plants. An operation in Georgia which started up late in 1948 is producing substantial tonnages with a sink and float process followed by flotation. Millheads are obtained from vast tailing ponds of earlier log-washing operations.

In Missouri the finished product comes from residual surface soils and clays beneficiated in log-washing plants which employ jigs to concentrate the material. Arkansas production comes from two large flotation plants treating replacement-type ores which seldom exceed 60% $BaSO_4$. The Arkansas finished product meets all specifications in its final form.

Ore from underground operations in Arizona is treated by flotation. All ores mined in Nevada require no further treatment beyond grinding for the well-drilling industry, and crushing for the chemical industry. An Idaho operation which started in 1949 produces a finished product which requires only dry grinding.

Consumption Increases

The U. S. Bureau of Mines reports that domestic production of barite (finished product) was 777,841 short tons in 1948. Early reports indicate that 1949 production will be about 850,000 tons. Domestic consumption in 1949 probably exceeded 900,000 tons. Lacking definite import figures, this estimate is based on the fact that domestic consumption was 894,000 tons in 1948; that domestic production was greater in 1949 than in 1948; and that barite imports into the United States were greater in 1949. We can account for an increase in consumption in the drilling industry because oil wells are increasing in depth and encountering greater gas pressures. In 1948 this industry consumed 71% of the barite used, and in 1949 it is estimated that consumption will be about 76% of the total.

Consumption in the chemical industries did not change appreciably in 1949 as compared with 1948. Approximately 200,000 tons was sold to the chemical industries during the year.

Arkansas was the leading barite producer in 1949. Tonnage of finished product having its source in Arkansas totaled 335,000. One producer blended his product with an additional 25,000 tons of crushed high-grade ore from Missouri. All Arkansas production went to the well-drilling industry.

Missouri ranked second, producing 78,835 tons of finished product for well drilling, and 83,348 tons for the chemical industry. However, Missouri finished product did not find a ready market during 1949, and at the year's end approximately 60,000 tons of drilling mud grade material and 5,000 tons of chemical grade remained in stockpiles. The 15 washing plants in the state did not all operate continuously during the year and at the year's end at least four washing plants had suspended operations awaiting a healthier market.

Nevada ranked third as a producer, contributing about 98,500 tons to West Coast consumers. Of this total 64,000 tons was used for oil well-drilling purposes, and the balance in West Coast chemical industries.

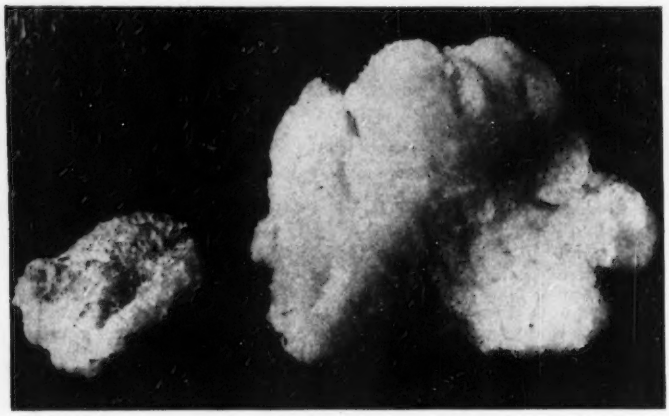
Georgia shipped about 30,500 tons to consumers in 1949—most of the production coming from the Cartersville area. Tennessee probably ranked fifth with an expected production of about 30,000 tons.

Arizona was the sixth largest producer in 1949 with approximately 18,000 tons coming from one source near Mesa.

A new small operation in New Mexico built a jig plant to concentrate ore for the drilling market, but at the year's end this operation had not sold any material. Another operation has been started up in New Mexico which contemplates mining a complex fluorite, galena, and barite ore. No production has been reported from this source to date.

Barite Imports

Imports of barite continued to come from Italy and Nova Scotia principally. A new operation in Mexico shipped 6,000 tons to the United States in 1949, but at the year's end imports ceased from Mexico because of an acute shortage of railroad cars. Most of the Nova Scotia barite goes to the chemical industries along the Eastern Seaboard. However, 9,000 tons of Nova Scotia ore found its way into the Gulf Coast oil field trade during 1949. It is believed that imports from Italy, Germany and Greece will not show appreciable increases over 1948 tonnages. Present tariffs are $7.50 per long ton on ground barytes and $3.50 per long ton on crude barytes ore.



AMERICA'S FAST GROWING PERLITE INDUSTRY is supplying large tonnages of the expanded mineral for plaster and concrete. Mineral expands 8 to 10 times when furnaced. Photo courtesy Alexite Engineering Co., Colorado Springs, Colo.

Perlite

S. W. JOHNSON, Manager Pan-acalite Division, Combined Metals Reduction Co., Salt Lake City, Utah

ALTHOUGH THE PERLITE INDUSTRY is in its infancy, it has made rapid strides during 1949 in the following phases:

1. Production of crude perlite rock crushed and sized ready for the expanding furnace.
2. Expansion of crushed perlite rock in various types of furnaces to produce several basic products.
3. Marketing of finished products.

Proper sizing is important in the production of an expanded aggregate to meet building code specifications on sizing. Perlite rock is actually a type of glass and shatters easily into slivers, thus producing excessive fines. The rock is extremely abrasive, thus causing heavy wear on crushing surfaces.

Many types and combinations of crushers have been tried, but the answers are not all in yet. Some producers use jaw crushers and rolls, others have tried cone crushers and rolls or hammer mills. One practice employs a wet circuit and a rod mill. Still another uses the Holland crusher, a high speed impact type that attempts to reduce mine-run rock to the final product in one unit. The most serious problems are maintenance of equipment, keeping undersize to a minimum, proper gradation of product to meet specifications, and the dust hazard. Equipment wear is high and presents a serious cost problem.

Where a clean perlite is available, the problem of preparation is simplified as it is not necessary to separate waste.

The market for perlite ore requires very close sizing and this necessitates a comprehensive screening and collection system and storage bins for storage of various size ranges. Blending back from these storage bins of the various sizes appears to be the only positive way of controlling gradation to the degree required.

Close Sizing Is Important

Standard vibrating screens are employed and a new Symons V screen has been used with good results. The Symons screen is a vertical screen rotating with a motion similar to that of the Symons cone crusher, rotating about its axis and oscillating in such a manner as to alternately force the feed against the screen and then release it. The rock is fed from the center with the undersize passing through and the oversize dropping inside. Screening can be used effectively to about 50 mesh. Material smaller than 100 mesh is usually rejected by air classification in a dedust er.

Free moisture in the sized rock adds to freight costs, already a serious problem, and presents problems in furnacing. Therefore, free moisture should be kept under 1% if possible. Shipments are generally made in box cars or covered hopper cars, and extreme care must be taken to plug all holes or cracks through which the fine material can leak out. Much of the crude is shipped East, involving long freight hauls, and small leaks can mean substantial losses enroute.

Dry crushing and sizing seems to predominate among producers of raw perlite rock and presents a dust collection problem. Perlite is essentially an aluminum silicate and producers are keen to avoid undue dust concentration in the atmosphere, thus preventing a health hazard. This is of much less importance after the perlite has been expanded and even in the processing plant. The end product has a tendency toward cellular structure. After the processed perlite reaches the construction job, the character of the dust and its low concentration is not as great a hazard as dusts of other sharper and more solid construction materials.

In dry crushing it is, therefore, necessary to take elaborate precautions to keep the dust hazard at a minimum. This is done by enclosing all crushing, screening and transfer points and providing satisfactory dust removal at these points. Final collection of the dust is accomplished in multiclones and baghouses or by precipitation in a water spray. No large market has been developed for the fines in the dust as yet and this material is usually sent to waste.

Prices on crude perlite sized for plaster or concrete aggregate range from $4.00 to $14.00 per ton f.o.b. producer's plant. The variation in price is due to variation in costs of production in different localities and to the specification of the product.

Furnacing Problems

The problem of expanding the sized perlite rock is not a simple one and there are several different types of furnaces and methods being used. The objective is to produce a product with the least weight having the necessary strength requirements and meeting gradation specifications. One serious problem in furnacing is that of decrepitation with resultant excessive fines and low strength. Another is fusion in the furnace. These conditions can be partially controlled by careful furnace operation.

Temperatures necessary for expansion of the perlite rock range from 1,700 deg. F. to 2,300 deg. F. Perlites expanding readily at the

lower temperatures are known as "lively" and those expanding only at higher temperatures are known as "dead perlites."

Expanders vary considerably in their ideas on the desirable weight for finished material. This ranges from a low of 4 lb. to as much as 15 lb. per cu. ft. for plaster aggregate, and 6 to 25 lb. per cu. ft. for concrete aggregate.

Perlite supplants sand in plaster and concrete and is able to compete against sand by virtue of several outstanding qualities, principally its light weight. The economies of perlite are tied closely to the weight of the expanded material. This is particularly true east of the Rockies as there are no known deposits of perlite east of the Rocky Mountains and the crude rock must be shipped from the West at high freight rates. The degree of expansion is therefore very important in determining cost of expanded product, which is sold on a volume basis. In general, the cost of expanded perlite is substantially higher than sand, but the higher material cost can be overcome to a large degree by labor and structural steel savings. In certain applications such as concrete where dead weight is a factor, over-all building costs can be reduced because of ease of application and the fact dead weight due to concrete or plaster is only about one-third that of sand concrete or plaster.

Expanded aggregates are generally packaged in 4-cu. ft., 2 or 3-ply paper bags and sold by the bag. Retail prices on the West Coast for plaster aggregate range from 20 to 30c. per cu. ft., f.o.b. expander's plant. The prices become higher east of the Rocky Mountains, ranging from around 40c. in the Midwest to as much as 45c. on the East Coast, f.o.b. expander's plant.

Perlite Institute Is Formed

The Perlite Institute has been organized with headquarters at 35 W. 53rd St., New York City, to encourage industry unity on matters of specifications, research, dissemination of information, promotion and other matters of common interest. The Institute was founded in May, 1949, at a general meeting in Los Angeles and held another meeting in September at Colorado Springs. Committees have been formed and progress is being made on the various basic problems.

Marketing of crude and expanded perlite has been complicated by lack of standardization in the industry. The Perlite Institute is serving to correct this.

The problem of the producer of crude perlite rock is to furnish a material crushed to a sizing that will give an expanded product meeting building code sizing specifications for the particular aggregate that is being made. Different furnaces have different expanding characteristics and do not necessarily give the same sized product from the same sized feed. Thus a large variation in rock sizes to be furnished by the producer of crude perlite resulted in high losses in dust and fine sizes and higher costs. At present expanders have more or less standardized on several basic screen sizes for various purposes, permitting the producer of crude to standardize his operations and reduce costs.

The producer of perlite rock must furnish a uniform product to close sizing specifications if he expects to build a market for his material. The crude should have not more than 5% inert rock, give a white product on expansion and have uniform expanding characteristics from car to car.

Marketing of the expanded perlite has been concentrated in two main products: plaster aggregates and concrete aggregates. Other uses such as loose fill insulation, soil reconditioners, etc., are minor at this time.

Plaster Is Best Market

The largest market for the expanded product at present is as plaster aggregate. Its use in plaster spread rapidly as the trade became informed of its advantages. However, being a new product and due to lack of standardization among producers there is still a big selling and educational job to be done. The big need in the industry at present is for standardization of product and specifications. Much research needs to be done and tests made to establish fire ratings, strengths, acoustical properties and all the other data necessary for architects and structural engineers to know in specifying use of the material. Some of this work has been done and more is being done as rapidly as possible.

One of the big jobs of the Institute is to assemble and correlate what has been done and outline additional work to be carried out.

Perlite is also used as loose fill insulation and in acoustical plaster. In this latter field it appears to be highly satisfactory.

Another very important use of expanded perlite is in lightweight concretes. The potential market for this purpose is tremendous and is developing rapidly. The advantages are in the saving of deadweight, high insulating and fireproofing quality, resiliency, ease of handling and application. Large savings are possible in structural members on large buildings. Precast slabs for roof decks and walls promise better small buildings at lower costs.

Phosphate Rock

JAMES A. BARR, Consulting Engineer, Mt. Pleasant, Tenn.

AS IN THE PAST, the phosphate industry has continued to meet rising labor and material costs with increased efficiency so that only a small part of the increased cost has to be passed on to the consumer. With the return of normal markets and increased competition, activity in research and development has been greatly increased.

Florida Pebble Field. The rapid increase of capacity during previous years has not been maintained into 1949, except for progress in improved methods.

Virginia Carolina Chemical Co., according to C. E. Heinrichs, vice president, is making radical changes in pumping which will be followed by spaced 1950 deliveries of two 17-cu.yd. electric draglines.

The Homeland flotation plant, south of Bartow, is a model of simplicity in structure and flowsheet. Recoveries of 90% and better are being obtained because of low sliming loss and minimum circulating loads.

American Cyanamid Co. started a new flotation plant at Sidney, between Mulberry and Tampa. See Milling Review, page 118.

American Agricultural Chemical Corp. has installed a complete belt conveyor type wet storage and a two-unit drying plant at their Pierce property.

International Minerals and Chemical Corp., according to R. B. Fuller, manager, started operating a new drying plant with one 8x80-ft. drying unit. This indicates a trend to larger units and contrasts with the 42-in.x32-ft. dryers common in 1930.

The drying plant is integrated

with the Noralyn mine and beneficiation plants to make a complete operation from matrix to railroad car. This drying plant is very successful. Rated capacity was exceeded by a large margin and fuel economy is high. A novel feature is the use of a single oil burner in the dryer furnace with twice the capacity of older burners. An exceptionally large volume of air for combustion and drying is exhausted through a two-stage Buell dust collector.

Armour Co. is now operating a new triple superphosphate plant near Bartow which uses dry-ground Florida phosphate and sulphuric acid to make phosphoric acid in the first step and triple super in a second step.

The Davidson Chemical Co., according to Dr. V. Sauchelli, research director, started a new flotation plant at their Pauway No. 4 mine and washer, increasing their capacity by 85,000 tons per year.

Tennessee Field. Few changes were noted during the year. Federal Chemical Co., according to D. S. Miller, vice president, has started a modernization program to install Dorr sizers in the Ridley washer and will replace some of the wooden structures with steel. The Ridley washer flow sheet includes a liquid-phase cyclone that has been used successfully as a classifier for more than 25 years.

Western States Phosphates. Production has slackened generally in Montana, Idaho and Wyoming. (See table.) Florida came in with a higher-grade phosphate and recaptured the bulk of exports to Japan. In addition, triple superphosphate from increased Florida output has been pushing into territory served by Western production.

Production from the Garrison, Mont., area seems to have dropped off during the year, but Idaho held steady because of added electric furnace demand at Pocatello.

Anaconda Copper Co. added a second triple superphosphate unit at Anaconda which will increase capacity, according to R. A. Jones, sales manager. Simplot Co., on the Fort Hall reservation, mines high-grade rock for use in production of superphosphate and sells the overlying lower-grade phosphatic shale to Westvaco for the production of elemental phosphorus. Output of the strip mine at Sage, Wyo., goes mostly to the West Coast. Some rock from the western area has been shipped to Trail, B. C.

U.S. Production of Phosphate in thousands of short tons

	1947[1]	1948[1]	1949[2] (est.)	1950[3] (est.)
Florida ...	6,455	7,184	6,900[5]	7,500[4]
Tennessee.	1,412	1,500	1,500	1,500
Western ..	1,220	704	700	800
Totals ..	9,087	9,388	9,100	9,800[5]

World Production In thousands of metric tons

	1947	1949 (est.)
United States	9,232	9,538
North Africa	5,838	6,063
Oceania and Asia.....	837	1,172
Various & Soviet[6].....	2,324	2,609
Totals	18,267	19,382

[1]U. S. Bureau of Mines.
[2]Staff, International Minerals & Chemical Co.
[3]Loss of tonnage during strike.
[4]Increased plant capacity in Florida.
[5]With stocks replenished in 1948-49, the 1950 production will depend on sales.
[6]Definite data from behind the "Iron Curtain" not available.

World Situation.[1] In general the outlook for 1950 is encouraging. There is no doubt that 20 million metric tons can easily be produced in the world and can as easily be absorbed. New outlets are being discovered and more so-called backward nations are developing fertilizer industries. Therefore, if political and economic conditions in the world are right, world phosphate miners can look forward to increased activities in 1950.

In the "Iron Curtain" area, shipments by Russia from the Kola Peninsula have not reached out as formerly to Holland, Belgium and Italy. These countries have had difficulty in getting requirements. Some of the deficiency has been supplied by U. S. A.

The French are trying to increase Morocco production but lack cash and are looking to U. S. A. for aid. Any material expansion would be a serious threat to exports from Florida. The present Morocco bottleneck is transportation from mine to coast. Labor difficulties also hinder output. The mines are developed to produce 4 million tons per year, but the present limit is 3½ million tons.

Tunisia and Algiers mines are developed to produce 3 to 3½ million tons, but output is limited to 2.6 million tons because of transportation bottlenecks. A new electric line under construction will remedy the situation provided the output can be sold. The grade of phosphate is 58-63-65% BPL as compared with Morocco's 70-75%.

Egyptian mines have a yearly capacity of 400,000 to 500,000 tons of 58-65% BPL grade. Mining costs are higher than in Morocco, but transportation of only 25 to 30 miles to the coast as compared with Morocco's 200 to 250 miles, and Tunisia-Algier's 90 to 110 miles is a compensating factor.

As in the past, cheaper water transportation rates will be the future key to competition with the U. S. A.

In the Far East production has been increasing. Ocean Island and Nauru are approaching their pre-war output of 1.2 million tons. Output from other islands, including Makatea, Christmas Island, Angaur and Daitojima is expected to be 530,000 tons per year.

Japan is one of the principal outlets for U. S. phosphate in the Far East. Purchases are now controlled by occupation agencies. Japanese import requirements of phosphate rock for fiscal 1950 have been reviewed and revised several times by the Government. The following figures appear to be correct at present:

	Metric Tons
Total requirements fiscal year 1950	969,000
Carry over fiscal year 1951....	226,000
Net requirements for fiscal year 1950	743,000
Programmed Purchases:	
Angaur	156,000
Kita Daito (Converted to equivalent 31% P_2O_5).....	19,000
Others	568,000

It is probable that the Army (QM) will purchase 70,000 to 80,000 tons of rock in New York and that SCAP and/or the Japanese Government will buy U. S. rock in Tokyo before the end of the current fiscal year.

Research and Development: Stream and air pollution from phosphate operations is getting increasing attention because of its importance in public health and relations.

There are many and conflicting

[1]On-the-spot observations in Europe, Africa, Japan, and the Far East have been contributed by Franklin Farley, vice president; G. W. Movers, sales manager; H. F. Dengler, export sales manager; T. A. Bruns, assistant export sales manager, Phosphate Division of International Minerals & Chemical Corp.

opinions regarding the pathological effects of fluorine in the atmosphere and we find many pending law suits alleging damages from fluorine from phosphate operations.

The University of Florida Experiment Station has an extensive program which has, among many other things, dispelled some popular notions, such as blaming the "red tide" and the resulting windrows of dead fish on bathing beaches on phosphate wastes.

Dr. R. C. Specht, in his talk at the 1949 meeting of AIME at Tampa, disclosed that the phosphate effluents from plants are not toxic and did not kill fish; moreover, that clear effluent waters from phosphate operations are beneficial to streams.

On the other hand, it is recognized that fluorine in appropriate form and quantity in our diets is essential for proper tooth structure. Under guidance of the Rockefeller Institute, the City of Evanston, Ill., adds a fluorine salt to the drinking water supply to abate caries.

Feldspar

MINES AND PLANTS in the Spruce Pine area, North Carolina, were producing feldspar, mica and kaolin in December at the rate of $6,500,000 per year. This rate, it is thought, will probably be increased as soon as a recently finished plant, built to produce dry-ground mica, is started and the operations of certain other producers are stepped up. Production in the first nine months of 1949 was considerably below that for the corresponding period last year, but improved greatly in the fourth quarter. Ample orders are anticipated for the first quarter of 1950. Employment for the district is at an all-time high.

Better methods of mining and preparation for market have greatly increased the district's mineral resources. One of the most significant improvements has been in the treatment of mica, whereby the recovery of fine product has been almost trebled.

The 75c. minimum wage rate became effective in January. Some plants had been paying more, others less. Most of them had been approximately half way between the new figure and the previous minimum of 40c. The resulting increased cost can be met only through further modernization.

Freight and Feldspar

Feldspar plants in the Spruce Pine district have benefited from the higher freight rates that have prevailed since 1940, although placed in a less favorable position to compete in certain areas. Whereas North Carolina producers turned out about 42% of the feldspar ground in 1948, they are now supplying approximately 65%, due to the change.

About 53% of the ground feldspar was used in making glass in 1948, the latest year for which figures are available. Of the balance 40% went into white pottery and allied products, 5% into enamel, and 1.6% into soaps and abrasives. The price of the 20-mesh product specified for making glass is only $1 per ton higher than before the war. This has come about through the application of froth flotation on a large scale. The first plant of this sort to be built was that of the Carolina Mineral Co. at Kona. Capacity there has been increased from time to time until now the plant can handle 700-800 tons of crude every 24 hours.

Early in 1949 Feldspar Flotation Co. also placed a newly-built flotation plant in operation, in Spruce Pine. Its capacity has not been divulged but is understood to be somewhat less than that of the Kona operation.

To illustrate the effect of higher freight rates, a feldspar flotation plant completed in 1948 near Canon City, Colo., has since found it impractical to operate.

Extensive research has been done on other methods for separating feldspar. A sink-and-float pilot plant is to be installed.

Prior to the long research that made it possible to employ flotation for producing feldspar from low-grade material, the feldspar used for all purposes was produced by selecting relatively pure feldspar and dry-grinding it. Resources of high-grade feldspar east of the Mississippi would rapidly have become inadequate to meet the greatly increased demand. The big requirements of glass makers made it imperative to develop some method of recovery that would give a lower-cost product. This method was found in froth flotation which was applied to treating the alaskite of the Spruce Pine area.

Flotation of the alaskite yields a product comparatively high in soda, whereas the pottery trade has always preferred one high in potash. This preference is expected to disappear when competition brings about the use of the lower-cost soda feldspar. Meantime an increasing percentage of the glass feldspar is coming from the flotation plants. The dry grinders are still very much in that market, but the comparative costs of the crude they use and of the alaskite used by the flotation plants puts them in a difficult position in competing for the glass trade.

Crude feldspar of the quality required by the grinders is about $8.50 a ton, delivered to the plant for the No. 1 grade that is mainly used. The alaskite, however, occurs in huge dikes in the Spruce Pine district and can be shot (when blasting is necessary), loaded by power shovels, and delivered to the crushers at the flotation plant at a price under $1 per ton.

There are no byproducts from the dry grinding of crude feldspar, whereas the flotation plant, treating alaskite rock, recovers also the mica and iron-free quartz sand.

At the end of 1949 the dry grinding plants in the Spruce Pine district are all running to capacity. Flotation, however, is expected by some to supplant dry grinding to an increasing extent.

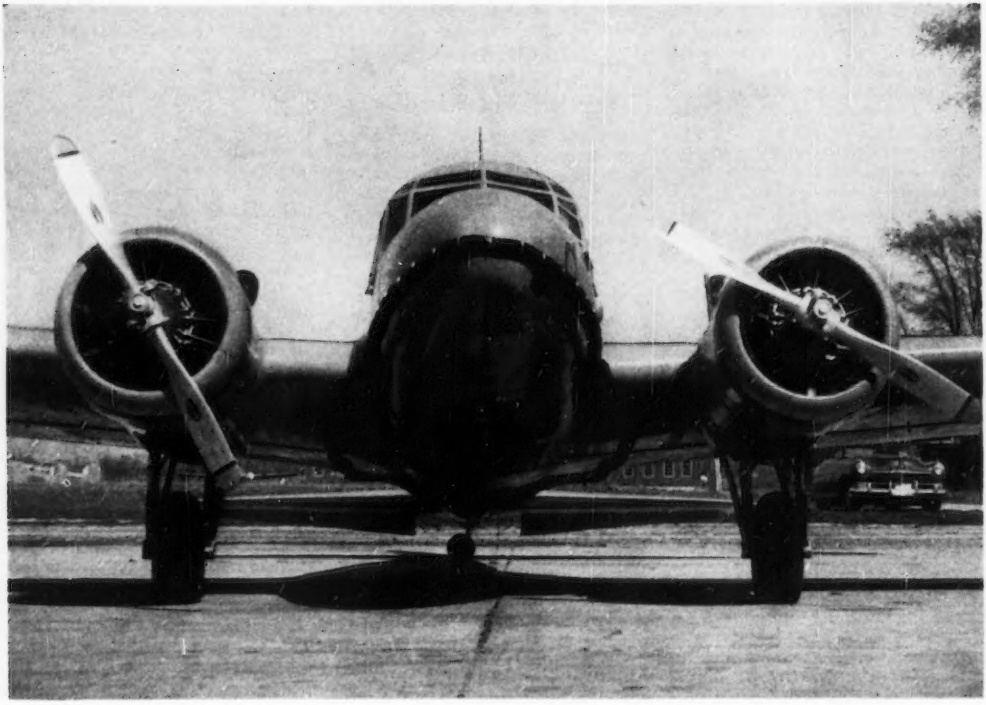
Just what effect the new 75-c. minimum-wage rate will have on the cost of crude remains to be seen.

Production of feldspar in the Spruce Pine area in 1948 was valued at about $2,400,000. In the last quarter of 1949, it is estimated, it was at an annual rate of at least $2,750,000.

Mica and Kaolin

Practically all the dry-ground mica marketed in the United States comes from the Spruce Pine district. About 45% of the output of wet-ground mica also came from Spruce Pine in 1948.

All of the primary kaolin, or china clay, produced in the United States is mined and refined in the Spruce Pine district by the Harris Clay Co. It is recognized as having no superior in the world. Present operating rates of the company's plants total approximately 25,000 tons annually. Should sustained demand warrant, the capacity of the existing plants could be increased at a comparatively nominal cost. Large amounts of fine mica also are recovered in treating the crude kaolin.



IN THE NEW AIRBORNE electromagnetic equipment shown above, the coil around the fuselage induces secondary alternating field in the ground traversed by the airplane. Variations in field intensity picked up by sensitive receiving units make it possible to detect bodies of sulphides, shear zones and other geologic structures.

The Airplane Dominates in Modern Exploration Methods

Airborne magnetometer and new airborne electromagnetic method aid in determining geologic structures and discovering minerals in unexplored areas.

HANS LUNDBERG, President, Lundberg Explorations, Ltd., Toronto, Ontario, and BASIL T. WILSON, Chief Geologist, Lundberg Explorations, Ltd.

DURING TWO WARS the mining industry has been able to satisfy the demand for metals, but now the demand is increasing so fast that known deposits of major metals are being depleted at an alarming rate. It is feared that normal frequency of new discoveries will not be sufficient to replace known ore reserves before they are completely mined out, unless exploration for new ore is intensified by all means possible.

Systematic exploration must be undertaken with the aid of modern techniques and methods, and intimate cooperation between the geologist and geophysicist must be established. Known mining districts must be thoroughly explored so that all mineable orebodies can be discovered; then new mining fields must be looked for. Many promising areas exist, but these have not been explored because of unfavorable climate, inaccessibility, and remote location.

The best method of exploration must be selected and systematically employed to produce rapid and reliable results. It is quite possible that old routines and techniques must be radically revised and modernized. The geologist must be relied upon principally to locate orebodies in known districts, while the geophysicist with airborne equipment may be most able to point out favorable portions in vast areas of unexplored countries.

Here, of course, the geologist is

most important. If information from the past history of mining is not available, he must make a detailed study of structures, phases of alteration, mineralogy, and origin of the known bodies. From these he will obtain clues to guide him in exploring the immediate vicinity. To utilize these clues, he may find it advantageous to use geophysical and geochemical techniques. Use of these methods has thus far been confined to rather small areas, and a more general use over larger areas would be more beneficial. In addition, they furnish the geologist with a better perspective and aid him in solving immediate problems.

Every geologist and geophysicist is familiar with the handicaps caused by property boundaries and the confined areas of claims. He is able to collect data, but perhaps clues which would make interpretation possible are found outside the claim boundary. Since the airlanes are still free, it is possible to make geophysical recordings over any desired area, and therefore airborne geophysical methods may overcome this handicap. The geophysical and geological picture in a mining area may be obtained from the airborne records, and thus the geology or structural problems of a claim or confined mining property will be better evaluated and understood.

In addition, it has been found that the data recorded by airborne instruments are easier to interpret than the results from ground surveys. Surface and topographic effects are minimized and only more important anomalies recorded. This gives a clearer picture of significant features. As airborne records can be taken at different altitudes, information may be obtained as to depth as well as length and width of orebodies. Furthermore, airborne surveys are much cheaper than ground surveys. Thus it seems reasonable to expect that mine owners in the older camps may pool their resources and have airborne surveys made of the entire area.

Micro-Chemical Analysis

Early prospectors used certain clues to locate metals. For instance, color and character of vegetation and soil gave hints as to the presence of copper, lead or zinc in rocks. In recent years these facts have been recognized, and the part played by plants and trees in absorbing metals during their growth has been studied. New methods have been developed to detect and determine minute quantities of metals in bark, stems and leaves of plants. The micro-analysis of trace elements in plants has now been extended to soils and waters, and an ever-increasing value is being placed on these methods in studying old mining areas, as well as in the exploration of new areas, especially as a first check in locations indicated as favorable by airborne geophysical surveys.

As chances of finding new orebodies in old established mining districts decrease, we must reach out into unprospected and undeveloped areas which for political reasons, remote location from industrial centers, adverse climate, or inaccessability have been unprospected. Many times lack of roads or rivers has barred geologists from areas. A survey on the ground of such a territory involves great expense. Moreover, ground studies may only cover limited portions after long periods of exploration. Such exploratory expeditions generally follow the line of least resistance and perhaps bypass portions of the country which could well contain valuable orebodies.

Aircraft Can Reach All Areas

Fortunately to gather information on remote areas, we do not have to rely on these old methods any longer because aircraft can reach all areas rapidly and easily. The geologist can now fly over an unexplored country and collect data and photograph visible features. There are many areas, however, where photographs serve only to indicate topography and variations in vegetation. In such areas essential information and clues may be recorded by airborne geophysical instruments to aid the geologist in selecting areas for detailed exploration.

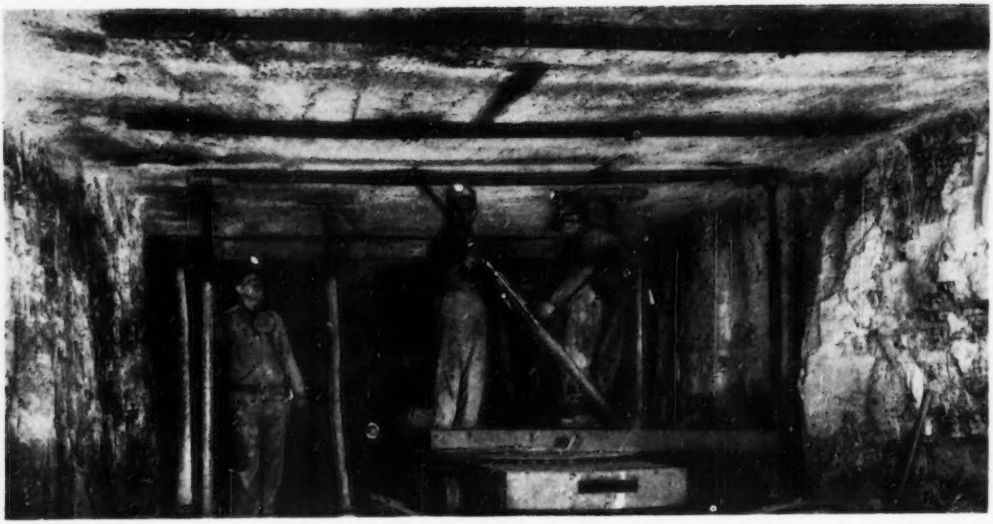
Of the airborne geophysical methods, the magnetometer has been used extensively during the last few years in Canada, United States, Sweden and elsewhere. In Canada it has been used to search for major structures similar to the Larder-Malartic break, pyrrhotite bodies like that at Lynn Lake, and iron ore in the Algoma district of Ontario. It is now used in the oil fields of Saskatchewan and Alberta. In the United States such surveys for iron ore (magnetite) have been very successful. The airborne magnetometer has also been used to locate portions of serpentine bodies containing asbestos. In this case, the asbestos occurred with concentrations of magnetite. Here the outlining of magnetic highs became a rapid method of directing exploration to portions of the area where asbestos was most likely to be found. In Sweden large bodies of magnetite were located by the airborne magnetometer.

New Electromagnetic Method

Quite recently an important development has taken place in airborne geophysics. In principle the survey is carried out by creating an alternating electromagnetic field from a large coil wound around the fuselage. During flight this electromagnetic field induces secondary alternating fields in the portion of the ground that is passed over and, depending on the distance to and the conductivity of the ground itself, these secondary fields vary in intensity and traveling time. The effects of these secondary fields are recorded in a specially made receiving unit built into the aircraft wings. Any changes in conductivity (orebodies or structures of lower or higher conductivity) cause variations in the secondary field intensities, as well as in the time it takes for the signal to reach the receiver. With careful balancing and compensating devices it has been possible to build very sensitive receiving units. This has been one of the greatest achievements in the field of geophysics in the last ten years.

By the airborne electromagnetic method it is possible to detect bodies of sulphide, major shear zones, and other structure of economic importance, and its use, together with the airborne magnetometer should be most helpful in selecting such portions of undeveloped areas where detailed exploration or prospecting on the ground may be justified. In this way it will be possible to plan and lay out the most useful and effective roads to reach the most favorable spots at minimum cost.

At the University of Toronto important research has been carried on to determine temperature and pressure of vein material deposition. It has been found that the deposition of gold in the Precambrian occurred between narrow temperature and pressure limits. If the favorable limits for deposition are lacking, there will be no chance for the existence of a commercial gold deposit. It is evident that geophysical and geological work of this nature will be of utmost importance to determine the ore-making potentialities in an area.



ROOF BOLTING replaces timber sets for supporting the back. A stoper serves for drilling the pin holes. See p. 112.

Drilling Still Holds the Attention

A. H. HUBBELL
Managing Editor

BLAST-HOLE DRILLING continues to be of major interest to the mining industry. That interest is divided between tungsten carbide as drilling medium and the throwaway, or single-use, type of detachable steel bit. The interest in carbide drilling in turn is divided between the detachable carbide bit and carbide-tipped forged steel. These three drilling media are being tested widely throughout the industry, and in places one or the other has already been adopted for production. The tipped steel has aroused the keenest interest, especially among those users of detachable insert bits who have had trouble with the connection between bit and rod.

Although attention is focussed on these three drilling media, the older detachable *steel* bit which is intended to be used several times remains very much in the picture, likewise forged steel, both carbon and alloy. The diamond drill, moreover, is still a factor in breaking ground. Thus the newer drilling media are in competition with the older, as well as with each other.

Other outstanding developments in mining practice are the growing use of short-period delays in blasting and of roof-bolting for ground support.

Continuous Mining. Operation of the continuous mining machine, which was introduced to the coal industry a year ago and which is expected to find use in mining some of the softer non-metallics, such as borax and potash, has yielded information indicating the possibility of effecting a substantial reduction in costs. However, due to interruptions in coal mining during the twelve months, it has not been feasible to develop long-range, continuous-duty operating statistics. Further savings are to be expected as new mining methods are devised that are better suited to continuous mining. By the end of the current month there will be approximately 60 machines of the latest type in the coal industry.

The Single-Use Bit. Only one bit of the single-use or throwaway type[1] was introduced to the domestic mining industry on a production basis in 1949. This is the Timken one-use bit, which has been on test for some time. It is described in detail on pages 140 and 141 of this issue, having been announced in *E&MJ*, Dec., 1949, page 101.

Experience, Opinion Varies. Experience of users of throwaway-type bits is varied, even for the same bit, as is true of drilling experience in general. To illustrate, a Nevada company claims to have cut its drilling costs in half by changing from the conventional multiple-use detachable bit to one of the several single-pass types. A British Columbia gold producer, using the same bit in a different size, was not satisfied with footage or performance. Changing to another make of single-pass bit, it doubled the footage but is having trouble with the attachment and with bit breakage. A Quebec gold mining company is using the first of the two single-pass bits for all drifting and raising.

Combined Metals Reduction Co., Utah, has standardized on the Liddicoat single-use bit. Costs to date indicate a direct saving in excess of 50% on bit cost, with faster drilling and fewer missed rounds, as compared with the multiple-use bits formerly used. The single-use bits have proved superior also to carbide-insert bits save in very hard rock, likewise to carbide-tipped forged steel. With them the com-

[1]For single-use and multiple-use steel bits previously discussed the reader is referred to the respective Surveys in *E&MJ*, Feb., 1949, page 96-101; also Feb., 1948, pages 96-99, and Feb., 1947, pages 92-97.

Outstanding Developments in Current Mining Practice

1. CARBIDE-TIPPED forged steel used in light jackhammers on a jack-leg set-up is finding wide acceptance in Ontario and Quebec—the result of an educational campaign by drill-equipment manufacturing interests in Sweden. There are users of tipped steel also in the United States.

2. THE SINGLE-USE or throwaway type of steel bit is rapidly winning friends in the United States. In Canada where it has been extensively used, it appears at the moment to be slipping.

3. DETACHABLE CARBIDE BITS, in several different makes and types, are in extensive use, despite trouble in places with the connection and with competition from single-use bits and tipped forged steel.

4. HIGH-SPEED electric-rotary drills are taking the place of jackhammers in a chrome mine in Southern Rhodesia. A mining group on the Rand is experimenting with rotary carbide drill stems.

5. LONG-HOLE DRILLING with percussion drills and sectionalized steel continues to replace blast-hole diamond drilling, but the latter is still going strong.

6. SHORT-PERIOD DELAYS find favor. Advantages are better fragmentation, less backbreak and reduced vibration.

7. SUBSTITUTION OF ROOF BOLTING for supporting ground instead of conventional timbering is proceeding rapidly in the industry. A Canadian operator is pinning the walls in his shrinkage stopes to cut down slabbing while mining.

8. THE NUMBER OF BELT CONVEYORS underground is growing. Advantage is greatest when development can be planned far enough ahead to include them.

9. TRACKLESS MINING is finding wider use in iron and base-metal mining. Equipment design is being modified for new conditions.

10. BETTER EQUIPMENT has been introduced for surface drilling. Tungsten carbide is being used in bits.

# of Mine Operators

pany has gone to smaller holes and smaller powder.

Calumet & Hecla, which makes the Liddicoat throwaway bit under license from Thompson Products, Ltd., St. Catharines, Ont., has increased its footage per miner per shift about 12½% since adopting the bit for its own use and cut bit cost per foot of hole to 1 cent, according to G. L. Craig. The company has designated Rock Bit Sales & Service, Philadelphia, as exclusive distributors in 16 Eastern states.

Western Rock Bit Company, as licensees of Thompson Products, make the Liddicoat bit in Salt Lake City for the 11 Western states, Alaska and the Philippines. Three new types have been added. These are forged with the Liddicoat connection without threads.

The "D" type was developed to overcome plugging in talcy ground. Its 90-deg. wings have a gentle undercut radius, and the slightly raised pilot has a 7/32-in. water hole. It is made in four sizes, ranging from 1 11/16 in. to 1 7/16 in. and is intended for ⅞-in. Q.O. drill rod. The "H" type bit, for highly abrasive rock, will be made in sizes from 1 15/16 in. to 1 7/16 in. and is adaptable for 1-in. Q.O. rod, also for ⅞- and 1-in. hex and 1¼- and 1¼-in. round rod. It has a 90-deg. undercut wing with a new star pilot offset from the wings for quick collaring with free discharge. The third bit, the "5-L", intended primarily for 1¼-in. round rod, is made in sizes from 3 in. to 1¾ in., and is thought suitable for wagon drilling.

Cost Cut by B. H. & S.

Bunker Hill & Sullivan's adoption of Throwaway Bit Corporation's bit has had many advantages, according to R. S. Hooper, talking at a meeting of the American Mining Congress. Drilling speed has increased, less explosives are used, drilling time has been cut. Feet drilled per bit, costing 15c., is 12.4, giving a cost of 1.21c. per ft. drilled. Corresponding cost for the carbide bit was 8 cents and for the detachable steel bit used 5.5 cents.

Another northern Idaho company has converted completely to this bit. Based on the use of 40,000 bits, its average cost has been approximately 3c. per ft. of hole drilled, as compared to 8c. obtained with bits previously used.

Highland-Surprise Consolidated Mining Co., in the same region, has cut its bit cost with the Throwaway bit to 11c. per ton from 48c. with standard multiple-use bits. Steel costs show a 30% reduction. Holes drilled are smaller, nothing larger than 2 in. being used for starting, compared with 2¼ in. previously.

On the other hand, a Tri-State zinc producer has used this bit without much success. Gage loss was excessive in the very abrasive flint.

At the same time, the 2¼-in. Joy single-use bit is being used at one mine by this Tri-State company. It has permitted a saving on bit consumption of about 50% over multiple bits.

Hollinger's Multiple-Use Bit. Cost per usage counts with the multiple-use steel bit. Hollinger Consolidated Gold Mines, Ontario, uses its own multiple-pass detachable four-wing bit, for use on ⅞-in. Q.O. drill rods. E. A. Perry supplies the following data:

Life	4.7 uses
Wastage through loss and breakage	0.5%
Gage, 1⅝-in. starter with 1/16-in. changes to 1⅝-in.	
Ft. drilled per pass	2.6
Ft. drilled per bit	12.0
Cost of new bit	14.34c.
Cost of resharpening	2.09c.
Bit cost per use, including handling charges and drill-rod preparation	6.30c.
Bit cost per ft. drilled	2.43c.
New bits used per day (approx.)	1,100
Bits sharpened daily (approx.)	4,000

At the Mike Horse, in Montana, bits used are the I-R Type O Jackbits. All drills have been equipped with chucks for 7/8-in. Q.O. steel. The change was made principally to save powder but resulted in faster drilling and better advance in drifts and raises. Fragmentation was better. There was no appreciable increase in shank and bit breakage, according to the company.

Are Steel Bits Losing in Canada?

Two Opinions. According to one opinion, the steel bit is not losing ground to the carbide bit in Canada, although it may seem to be, inasmuch as it is making no headway at the moment while people are waiting for a proven carbide bit. A Quebec engineer, at the Consolidated Beattie office at Duparquet, takes a different view, holding that, for breaking rock, both the steel bit and the diamond-drill bit are losing out. "As carbide bits become better and cheaper and as better connectors are developed for sectional steel," says R. F. Haflidson, the chief engineer, "the change-over should accelerate. Most operators in this area are either using small machines or are experimenting with them."

Consolidated Beattie has been using the single-pass bit in seven sizes from 1 5/8 in. to 1 1/4 in., in gage differences of 1/32 in., but is gradually changing over to the Holman 4-wing carbide bit, in four sizes from 1 5/8 to 1 1/4 in. The machine is a 47-lb. Holman "Silver Bullet," and is used either as a plugger for down holes or with an air leg for flat holes. It has a 2 5/8-in. bore, strikes 2,500 blows per minute. The percentage of total footage drilled with carbide bits increased from 7% in January, 1949, to 17% in November. Cost per foot is slightly higher for the carbide. The latter bits are being used in the harder ground.

Both Sheep Creek Gold and Zincton Mines, British Columbia, have adopted the Craig single-pass bit, which has permitted drilling smaller holes.

In South Africa, one mining house group has found that the average cost of drilling with PM throwaway bits varies between 13s. 6d. and 14s. per 100 ft., in comparison with a cost for tungsten-carbide bits that varies from 20s. to 102s. per 100 ft. The result is, of course, that the latter are not generally used in stoping on the Rand.

Many mines are using PM bits in diameters as small as 1 3/8 in.

Two New Carbide Bits

The Insert Bit. Despite difficulty experienced in places in obtaining a satisfactory connection between bit and rod, the detachable carbide-insert bit is in widespread use. Two new insert bits have been added in recent months to the list of those available. These are the Timken carbide bit and the Rok-Drill bit. The development of the former is described in *MCJ*, Jan., 1950.

Of the former, little that is descriptive can be said here just yet. The Rok-Drill bit, however, is made by Rock Bit Sales & Service, Philadelphia, and comes in a 2-point chisel type, 1 1/2 to 4 in. in diameter, and in a 4-point cross-bit type, 1 3/8 to 4 in. in diameter. Its carbide inserts are crowned to increase drilling speed. The bit is described briefly in *E&MJ*, Dec., 1949, pages 82 and 100. (Discussion of bits previously introduced will be found in the annual Survey in *E&MJ*, Feb., 1949, beginning at page 96; also in the February issues of 1947 and 1948.)

Reports on the acceptance of the carbide insert bit and the quality of its performance vary with the mine and the ground conditions.

Comments from the Field

Varied Opinion. That the insert bits have friends that favor them is witnessed by the following:

"They were first tried in 1948. During 1949 their use increased until today over 200 are in daily service."—Patiño Mines & Enterprises, Bolivia.

"We are using 1 5/8-in. Carset bits in one drift and three stopes. The greater speed has made it possible to complete a drilling and mucking cycle regularly in a shift."—Eastern underground iron mine.

"Tungsten carbide bits, already applied experimentally, will probably play a large part in future rock drilling."—Mufulira Copper Mines, Northern Rhodesia.

"Timken carbide inserts did remarkably in cross-cutting, some 2,000 ft. to the bit, and doing better without intermediate grinding, the insert and steel wearing in parallel."—Charles A. Chase, Shenandoah Dives, Colorado.

"1 3/4-in. Timken MCA carbide bits adopted mine-wide after 1 1/2 years of testing virtually everything offered."—Mine, State of Washington.

"Ingersoll-Rand and Timken carbide bits have greatly improved our secondary drilling."—Eastern open-pit iron mine.

"Tungsten-carbide bits, replacing one-pass steel bits in hard development rock, have doubled footage per man-shift, cut drilling and blasting cost slightly."—Base-metal mine, British Columbia.

"1 1/2-in. carbide bit, 30-lb. jackhammer and 7/8-in. hex. steel have improved drilling speed in blockholing big pieces."—Western open-pit mine.

"We expect to standardize on 1 7/8-in. Timken carbide bits for drifts and 1 5/8-in. Timken bits for stopes and raises."—New Jersey iron mine.

"Using Timken 1 5/8-in. Asterisk bit in hard ground, resulting in smaller holes more closely spaced. In semi-hard ore, we have been drilling long (30-50 ft.) holes with Kennametal wedge-type bits in larger sizes, permitting use of 2-in. powder."—Lake Superior iron ore operator.

"Use of tungsten carbide in detachable bits and forged steel has almost entirely replaced diamond drilling in long blast-hole drilling. Latter used only where setting up with machines using carbide bits is not practical. Most of the carbide drilling is done with 3-in. machines. Larger machine appears necessary in hard ground. Most suitable air pressure 75-80 lb. at drill."—M. D. Banghart, O'okiep Copper Co., South Africa.

"Experience has been confined to testing . . . On an average, we believe carbide bits are drilling 10 to 15 times the footage obtained from detachable steel bits. . . . Present price makes it hard to justify use in soft material."—Iron mine, Gogebic Range, Michigan.

"Failure of threads on bit or on rod have been the greatest drawback."—Combined Metals Reduction Co., Utah.

At Holden Mine

A Comparison of Performance. Single-pass steel bits (Craig) were replaced between April 1 and June 1 with 1 1/2-in. Carset jackbits for general mine use by Howe Sound in its Holden mine, Washington, according to John J. Curzon, general manager. Attention was directed to solving trouble with the stud connection. A system of treatment resulted (to be described in an early issue) which permits making the complete connection in the sharpener and increases the rod life. The table gives performance data for the two bits.

Comparison of Bit Performance

	Craig 1945-49	Carset 1949 to date
Feet drilled	1,616,459	269,387
New bits	821,424	1,881
Feet per bit	1.97	143.21
New rods	13,043	740
Rods reconditioned	43,507	4,164
Rod use	56,550	4,904
Feet per rod use	28.28	54.93

As a result of improvements in shop work and drilling technique, percussion drills, jointed rods, and 2-in. Carset bits eliminated diamond drilling of blast holes in the Holden mine, save where the length exceeded 70 ft. Average footage per bit for 1949 up to mid-December is 153.4. From August to November inclusive the average was 182.53 ft. per bit.

M. C. Brown, superintendent, Sidney Mining Co., Idaho, using stud-type carbide bits, holds that the higher drilling speed and cylindrical hole made by the bits more than offsets the lower cost per foot of hole drilled which might be obtained from Throwaway bits. The latter had been tried for a short time. A saving in powder also results.

Greater speed and bit life and reduced cost of drilling per foot of hole are the results netted by Cleveland-Cliffs Iron Co. by substituting jackleg-mounted jackhammers and carbide bits for tripod-mounted drifters and detachable steel bits in its Cliffs Shaft mine in Michigan. See *E&MJ*, Nov., 1949, pp. 98-9.

Swedish Equipment in Canada

Carbide-Tipped Forged Steel. Resort has been had in a large way to carbide-tipped forged steel in Canada and, more recently in the United States, to avoid the problem of securing a proper connection between the detachable carbide bit and rod. In the Dominion, the movement started 13 months ago with the organization of Canadian Copco, Ltd., at Kirkland Lake, a subsidiary of Atlas Diesel, of Stockholm. G. W. Blomdal is manager. Through educational and sales efforts of this company's representatives, many operators have been persuaded to try what for them was a new scheme of drilling, using carbide-tipped forged steel with light jackhammers of the plugger type on a jack-leg set up. Gages and lengths of Atlas Diesel steel below lug, ⅞ in. in diameter, Series I, are as follows:

Steel	Length, Ft.	Gage, In.
Starter	2.65	1.34
2nd	5.25	1.30
3rd	7.90	1.26
4th	10.50	1.22
5th	13.15	1.18
6th	15.75	1.14

The tests as conducted by Lake Shore Mines, Ltd., Kirkland Lake, Ont., were summarized in *E&MJ*, Aug., 1949, page 80. By early June, almost 7% of the company's total footage was being drilled with Swedish drills and steel. Early in January, Canadian Copco's equipment was being used by approximately 45 mines and five contractors in Ontario and Quebec. Three-quarters of these mines (which are in seven districts) are said to be the most prominent in their respective areas. Two of the mines have converted 100% to the use of the Swedish equipment. About 30% of the others appear inclined to adopt this equipment in the major part of their operations. The rest of them are experimenting.

The type of drill recommended is the 35-42-lb. plugger. It may be used for sinking, or with an air-feed leg for horizontal drilling and for holes up to 40 deg in stopes and drifts, or with a stoper-leg attachment for steeper holes in stopes or raises. This light machine, it is asserted, makes the carbide-tipped steel as reliable as any conventional steel bit. The largest saving claimed is in labor cost. Use of the jackleg, moreover, makes only two changes necessary in a 16-ft. round.

A company in the Sudbury area has tested the carbide-tipped forged steel with one light machine. Steel such as this has been drilled as much as 700 ft. before failure, averaging 300 ft.

Jumpers on the Rand

Tipped Steel in South Africa. On the Rand, the use of carbide-tipped jumpers is said to have increased. Ten percent of the total drilling, it is estimated, is being done by them, mainly on development work. For stoping, the usual drilling medium is the PM single-use bit.[1] Production of carbide bits is starting at a factory on the East Rand where the mines are using them increasingly. In hard-rock development, increases in drilling speed of as much as 100% have been obtained by the use of carbide. In stoping, drilling speed has increased but little.

Rotary Stems. Drilling with rotary stems is said to have been used in the Premier diamond mines near Pretoria.

In Southern Rhodesia, the jackhammer is being replaced by high-speed rotary electric drills. Last year Umvukwe Chrome Mines started experimenting with them and by mid-1949 had 20 in use. They have been satisfactory in rocks having a hardness up to 4.5. Two natives, it is said, can drill 70 holes per shift with them. They weigh about 40 lb., have motors rated at 1½ hp., and operate on a three-phase, 125-volt, 50-cycle current.

[1]See opposite page, also *E&MJ*, Feb., 1949, Pages 98-99.

Blast-Hole Diamond Drilling Loses Ground

Diamond Drills Yield in Places. Results of a survey published in *E&MJ*, Oct., 1949, p. 97, showed that 14 out of approximately 50 mining companies that had been diamond-drilling their blast holes for at least part of their production were converting, in whole or part, from diamond drills to rock drills, using sectionalized steel and carbide bits. Four of the 14 had converted completely. The outstanding case was that of the Holden mine, in Washington. The greater drilling speed and lower cost to be obtained with carbide bits were among the reasons, also the higher prices asked for industrial diamonds and the poorer quality of the available stones. The survey thus shows that blast-hole diamond drilling is nevertheless still being considered as a means of breaking ground.

During the year one company in an Ontario district diamond-drilled 20,000 ft. for blast holes. It found that to avoid excessive pressure and thereby prevent vibration, mudding and hole deflection, a bit speed of about 1,900 rpm. was necessary. This was obtained by using a bortz-set bit 1 13/64-in. O.D. followed by a reaming shell.

Long blast-hole drilling with a 3½-in. machine, 1-in. Q.O. carbon steel and a new type of coupling with a carbide insert bit were tested late in 1949. The holes were about 40 ft. long and drilling speeds were better than those achieved by diamond drilling. However, the coupling thread was not successful.

The Bureau's Oil Shale Mine. Unusual equipment to permit mechanized mining on a maximum scale to get a minimum cost features the experimental oil-shale mining project of the U. S. Bureau of Mines at Rifle, Colo. The drill carriages that were developed, the mobile compressor unit, and the equipment for loading blast holes and scaling the back and the face were shown in *E&MJ*, Nov., 1949, pages 92-94. Most recent figures, from the third test run, indicate a total direct cost of 29.2c. per ton of shale mined. Included are drilling, blasting, loading, transportation, scaling, fore-

man and surveying, electrical distribution, miscellaneous and labor burden. Further lowering of cost is anticipated through the possible development of a rotary-type blasthole drill.

To take down roof that carries profitable values in Tri-State zinc mines, Eagle-Picher has mounted on a jumbo crawler chassis telescoping masts that extend vertically to 65-ft. height, according to S. S. Clarke, general superintendent.

Of note also is the light, rubber-tired "drill wagon" designed and built by C. A. E. Lambly, general superintendent, Pend Oreille Mines & Metals Co., Washington. It is intended for drilling benches developed in contour mining.

Advance in Blasting

A Survey of Opinion. Short-period, or milli-second, delays are finding increasing use in blasting. Advantages include improved fragmentation, minimized backbreak, and reduction of vibration (*E&MJ*, Nov., 1949, p. 89). Instances of their use are:

". . . . along with additional powder buried along a sloping foot-wall which is detonated last to clear muck away."—Powell Rouyn, Quebec.

". . . where it is necessary to blast 50 or more holes in a single shot."—Eastern iron mine.

". . . in long-hole blasting with resulting better fragmentation."—Canadian base-metal mine.

". . . reduces secondary breaking, most noticeable in stoping. Cost price of the milli-second caps is slightly under the cost of conventional delays."—Tungsten Mining Corp., North Carolina.

". . . there seems to be a chance with these delays to use fewer holes and less powder. All the powder explodes and none is cut off by slower exploding caps."—Highland-Surprise, Idaho.

". . . standard in all our long-hole blasting."—Canadian Malartic, Quebec.

". . . on sublevel benches. Concussion is less . . . less loose . . . safer . . . less dilution."—Consolidated Beattie, Quebec.

". . . definitely better fragmentation than with cap and fuse or ordinary delays."—Copper mine, Arizona.

". . . used in cases to reduce shock on walls and improve fragmentation."—Hudson Bay M. & S. Co., Manitoba.

". . . in all long-hole blasting."—An iron mine, Menominee Range.

". . . in stoping can prevent hole robbing and get much better fragmentation."—St. Joseph Lead Co., New York.

". . . in diamond-drill blasting . . . have improved fragmentation."—Base metal operator, British Columbia.

". . . discarded as impractical in our ground."—Mine in Washington.

". . . used in open cut. When tried underground in drift, results were not good."—Eastern iron mine.

". . . used for some time in sinking winze but given up, due to excessive damage to steel sets."—Iron mine, Gogebic Range, Michigan.

". . . in larger drift headings. Some saving in powder, less fracturing of surrounding rock with possible saving on timber. But there has been trouble with bootlegging." . . .

Substitute for Timbering

Roof Bolting for Ground Support. A venture in Birmingham iron mining practice that has met with unusual success is the rather widespread adoption of "roof-bolting" for roof support instead of the well-known conventional timbering methods. As a result, many operators can point to improved accident experience for the year and an improvement in the quality of product shipped to the furnaces.

This practice of roof bolting is spreading. Incidentally, it is not new. (See *E&MJ*, May, 1943, pages 70-72; also Jan., 1950, page 82). According to the U. S. Bureau of Mines (I. C. 7533), it offers the industry a safe, efficient method of roof support. It has been applied extensively under widely different roof conditions and affords the possibility of developing new and more efficient methods of mining. Many questions regarding the theory and application of this type of support, says the Bureau, cannot be answered definitely yet. Present knowledge indicates that it is not a cure-all for all roof conditions. Moreover, a method that is successful in one mine may not be assumed to be safe for another without careful study. See picture on p. 108.

During the past year many operators (principally in the coal industry) have made experimental installations of suspension-type roof supports in cooperation with the Bureau. U. S. Smelting, Refining & Mining Co. plans to use such supports on an experimental basis in a limited area at its Lark Section (Utah) soon.

In the operation of one Birmingham ore mining company, all roof is supported on 1-in. split roof pins with wedge fastenings. Eight-inch square "shin plasters" or 5-in. channels are used. For drilling the holes, 1¼-in. carbide-tipped, chisel-bit Q.O. alloy steel is being used, in lengths of 5, 6 and 8 ft.

For service in connection with roof-bolting, Joy Mfg. Co. has introduced a self-propelled mine-car compressor, either track or rubber-tire-mounted, in three sizes (130, 175 and 240 cfm. delivered air at 100-lb. pressure). The company has also developed special stoper-type drills for this work.

Golden Manitou Pins Stope Walls. Pinning of shrinkage stope walls (mainly sericite schist) is being tried by Golden Manitou, Val d'Or, Que., to cut down slabbing during mining and while the stope is being drawn empty. Holes are drilled in both walls to 5-ft. depth and 10 ft. apart when face is drilled. Round 1½-in. iron pins threaded at one end and split at the other end for taking a steel wedge are used. The washer is a 6x8-in. ¼-in. plate. The pin is burred at the wedge end and driven to refusal. The nut is then tightened. Results to date are encouraging.

Use of steel sets in drifts by Cleveland-Cliffs Iron Co., Mich., is described in *E&MJ*, Nov., 1949, page 99. They are favored as more economical than wood under proper conditions.

A Gogebic Range iron mine, in Michigan, using timber, treated and untreated, for ground support, has been using a few pins to support the hanging side of a drift driven in quartz slates on the strike. Rods 6 ft. long and 1 in. in diameter are used with 8x8-in. pieces of ⅜-in. plate. Another operator on the same range plans to install plants for treating timber.

The topic of timber preservation is dealt with by the Bureau of Mines in Information Circular 7459, on the support of ground in the Lake Superior district. The Bureau concludes that effective methods of ground support are well known and miners should be educated in regard to them. The preservation of timber by chemical treatment at McIntyre-Porcupine mine, Ontario, is likewise described by D. E. Keeley, mine superintendent in the C. I. M. M. *Bulletin*, Nov., 1949.

Transport Underground

Conveyors for Moving Ore. Transport by conveyor, both belt and shaker, is receiving much attention. Referring to the Lake Superior district, the Bureau of Mines says (I. C. 7526) that its studies show that belt or shaker systems can be used to advantage where proper conditions exist. Advantages are greatest when development can

be planned far enough ahead to permit using belts or shakers in the program and to include haulage in stopes as well as in main haulageways.

Only five underground iron mines in the Lake Superior region have belt or shaker installations of any significant size. One of the newest is on the Menominee Range. It comprises two belt units, 275 and 325 ft. long, installed in the transfer-level drifts of stopes in a newly developed block, to transfer from the stope raise to the main haulage raise.

Cleveland-Cliffs' first underground conveyor is at the Cambria-Jackson mine (Marquette Range). It will transport ore to the new 8th level to pockets above the 7th. Ore will be dumped from cars on the 8th level to a 4x16-ft. pan feeding a single 30-in. belt 595 ft. long at plus-15-deg. inclination to make the required lift of 154 ft. vertically. The drive motor is 75 hp. The ore will not be crushed before loading. A conveyor 2,500 ft. long is being planned for the new 7th level at Mather "A" mine (Ishpeming) in place of electric haulage.

At the New Helen siderite mine of Algoma Iron Ore Properties, in the Ontario Lake Superior region, an underground belt conveyor system, 2740 ft. long and 450 tons per hour capacity, has been in operation 8 hr. per day since July 1949, raising ore from the crusher level at elevation 670 ft. to surface at elevation 1450 ft. Belt width is 30 in., speed 400 fpm., inclination 18 deg. Vertical height lifted is 780 ft. C. M. Beck is general manager.

An Iron Country operator is planning to install two underground conveyor belts for ore haulage.

A company in the Carlsbad potash area has installed two 36-in. belt conveyors in one panel to replace locomotives and cars for gathering. Costs have been reduced, but replacement cost and belt life have not been determined.

Conveyor belts are expected to replace tramming to a considerable extent in the underground operations of Mufulira Copper Mines, Northern Rhodesia, in the near future (*Bull. C. I. M. M.*, Dec. 1949).

Belt Replaces Shakers

Shakers Out of Block Caving Mine. A Southwestern company has installed a combination scraper-belt conveyor stope that enables it to mine in an area where previous mining has been extremely difficult and almost prohibitive in cost. The area is wet and heavy and with the grizzly level only 25 ft. above the haulage. Conventional mining resulted in excessive haulage-level weight that made drawing slow and erratic and repair cost high.

The installation is in a stope 100 x140 ft. in plan, served by four slusher lines. A 30-in. conveyor 200 ft. long at right angles to the slusher lines and about 18 ft. below serves all four slusher lines (the ore passing through 13-ft. incline raises to the belt). This belt conveys the ore to a haulage line out of the heavy area. Necessary repairs in the conveyor drift can be handled without interrupting the regular production. The stope easily produces 700-750 tons per 8-hr. shift and 220,000 tons has been mined from it.

This company, after several years of experimenting with stopes using shakers, has finally decided that shakers are not applicable to its problem. No further shaker stopes will be planned.

Shaker Design Improved. For use in metal mines, the main development in shaker conveyors in the last two years, according to Goodman Mfg. Co., has been a change in the mechanism of the drive which gives the higher speeds needed to move ore containing paint rock or other very sticky materials. Research has also been done on trough design, and the company has developed a semi-circular trough, which, it says, is very effective with sticky material. For such service, inclined cradles have also been developed to help in moving this material.

Trackless Mining Progresses

Loader Design Improved. Trackless loading and transport equipment, so successfully used in the coal industry, has been finding widening application outside that field since it was first applied to mining potash and other non-metallic minerals about 10 years ago. Since then has come its more or less experimental introduction for mining ores of iron, lead and zinc. The increased weight and abrasive qualities of these materials have called for changes in design, particularly of the loader.

To this end, the design of the Joy heavy-duty rock loader, the 18-HR-2, has been completed in a number of units put in operation. It is an improvement over previous models, particularly in its ability to stand up under severe operating conditions. Efforts to cut maintenance cost and idle time nave increased tonnage loaded per shift.

Engineering has been completed on another model of the same make, the 17-HR, and the machine is in production. Still another model having an elevated discharge for loading into trucks is planned.

Shuttle cars for loading rock, as compared with coal, potash and salt, exhibit no radical changes beyond those described in this Survey in the February, 1949, *E&MJ*. The Joy company, however, did complete its pilot diesel-electric car. This has been operating in the field for more than six months. Results are reported to be good. Traveling speeds are 8 mph. empty and 5 mph. with rated load, being higher than obtained with standard battery or cable-reel models. In addition to the advantages of having a self-contained power plant, the diesel-electric unit has greater capacity per unit of time by reason of this increased speed.

Three models of self-propelled, rubber-tired mounted drill jumbos are now available from the same manufacturer to meet varying conditions underground.

It is reported that Joy's self-propelled, rubber-tired mounted drill jumbo, with special modifications, can be used to cut drilling costs in surface applications. One such application has been for drilling toe holes in open-pit work, where the drills were equipped with feeds to give a 15-ft. change.

Trackless Mining in Birmingham. Several methods of loading ore by machine are being explored in the Birmingham iron district, Alabama. Of real promise is the application of trackless equipment, using tractor-mounted loaders and shuttle cars. Of equal interest is the application of rubber-mounted, jumbo drill carriages for better fragmentation of the ore for machine-loading, to increase advance per drill round and for more efficient use of labor required for breaking ore from face to footwall.

The year 1949 also saw the first use of electric-driven bulldozers in underground operations in the Birmigham district. The "dozers" have been used to surface roadways prior to making track extensions, thereby eliminating the hard task of leveling out with hand tools.

A Cost Comparison

Trackless Equipment vs. Track-mounted. Difficulties may arise in comparing trackless mining and op-

eration with trackmounted equipment. As one base-metal producer points out, there is a saving in direct cost, but when amortization of the equipment is considered, these savings are much reduced. Careful accounting is necessary.

In operating both types of equipment over a nine months' period, a potash producer found that the cost per ton was about 75% higher with the trackmounted equipment. However, the section in which the trackless equipment was used was more level and the potash seam was thicker. This difference in thickness made an appreciable difference in cost, inasmuch as the cost comparison was based on total cost for loading into cars, including drilling, blasting and undercutting. Today, under existing conditions, operating costs would probably average 50% higher for trackmounted equipment, according to the same source, than for the trackless. Maintenance and depreciation for it is less, however, so that the over-all figure would average less than 50% (despite this, the company's over-all mining costs are higher now than in 1943, due to increased hourly wage rates and supply costs).

Haulage Costs Cut

Bigger Units for Lower Costs. A Canadian mining company, to reduce haulage costs, planned more mechanization, bigger units. At one mine, scheduled to hoist 12,000 tons per day, a new 20-ton trolley locomotive has been installed. Its predecessor was an 8-ton unit. It handles 188-cu.ft. (8 tons capacity) Granby-type cars, in comparison with 52-cu.ft. cars used before. Rotary-tipple cars hauled have 260 cu.ft. capacity, compared with 100 cu.ft. in the cars displaced.

The Aluminum Ore Co., in the Kentucky-Illinois fluorspar district, has also cut costs by installing bigger locomotives and cars than those formerly used.

Combined Metals Reduction Co., Utah, has lowered its transportation costs by closer supervision through an assistant shift boss appointed to keep materials moving.

Another Canadian operator has put a pneumatic locomotive in service for working in isolated areas. This unit operates on a pressure of 200 psi.

With an over-all height of 41½ in., Atlas Car & Mfg. Co.'s newest battery locomotive has been designed for metal-mine service. A 32-in. wheel base gives greater stability. Other features include automatic couplers.

Trolley locomotives and new cars of Retsof Mining Co., New York, are painted bright yellow to improve visibility. The cars of 6½-ton capacity have automatic couplers, which can be released by a steel cable operated by a man standing clear of the cars.

Republic Steel uses low-alloy high-strength steel in its mine cars, finds that the car outlasts the car built of carbon steel by 30-50% and also gives a 25% reduction in weight.

Diesel Mine Locomotive in Tennessee

A mining company has installed a 30-hp. diesel locomotive in its zinc mine at Jefferson City, Tenn. J. P. Ruth, Denver, the builder, says the unit will take over the long haul to the shaft, with battery locomotives doing the gathering.

A mine phone communication system introduced by Mine Safety Appliances Co., Pittsburgh, is expected to improve underground haulage efficiency, economy and safety.

Mechanized Mucking. Bunker Hill & Sullivan's new mucker used in sinking an inclined shaft was described in *E&MJ*, Aug., 1949, page 69. Quemont Mining Corp., Quebec, mucked its vertical shaft with a Model 21 Eimco shovel, averaging 3.1 tons per man-hour in the last two months, in comparison with 2 tons per man-hour when mucking by hand (*E&MJ*, May, 1949, page 84). The shovel was able to handle 75% of the muck.

To get the most out of jumbo-shovel installations it is necessary to schedule the component operations carefully, according to Ray W. Jenkins, of Joy Mfg. Co., at a meeting of the American Mining Congress. Maximum advance at minimum cost is the objective.

At a Sudbury district mine, Ontario, where scrapers have long been in service, the folding scraper is now used in connection with inclined cut-and-fill stoping and a manganese-steel scraper of popular make has been placed in general service throughout the mine.

A self-loading transport handled by one man for loading rough material has been developed by D. I. Hayes, American Zinc, Lead & Smelting Co. (*M. C. J.*, May, 1949). It loads and moves itself with a substantial quantity of material and operates irrespective of grade. It is actuated by cables from a slusher hoist. A machine 24 in. wide will carry one ton, and one 48 in. wide will carry 5 tons. A 15-hp. slusher hoist will operate the one-ton loader, and a 50-hp. hoist the 5-ton machine.

Use of a scraper and mechanical shovel in combination is described in *E&MJ*, Nov., 1949. Muck down the slope in the stope is dragged uphill by the scraper to a mucking machine in the mouth of a crosscut and there loaded by the latter into cars.

For Better Lighting. An inquiry into the possibility of improving underground lighting was made in *E&MJ*, Dec., 1949, p. 88. The extent to which the advantages of fluorescent lighting, for example, can be realized in underground application is still a problem. Few mines have been disclosed that use it and those installations are limited to shaft stations. An Ontario company uses a compressed air-driven generator in each stope for flood-lighting scraper operations. MSA has improved its electric cap lamp.

Automatic Hoisting Favored

The Modern Hoist. Some new hoists have been projected or installed. Foremost is the double-drum unit which is to be used by Anaconda at the Kelley shaft in its Greater Butte project. Allis-Chalmers is furnishing the hoist itself and General Electric the 3,000-hp. driving motor. Like the Inspiration installation, the new hoist will be semi-automatic, being started by the station tender at the loading point. Such semi-automatic operation is much faster than the full automatic.

The main hoists of Combined Metals Reduction Co. have been equipped with electronic overwind and overspeed controls designed and built by C. M. Marquardt, of the staff. They are working satisfactorily.

Potash Co. of America, Carlsbad, N. M., installed a double cylindrical drum Nordberg hoist with 10-ft.-dia. all-welded steel drums, that is unique in having no shaft through the fixed drum. Planned originally to be semi-automatic, it was made fully automatic after installation. It hoists in balance from 1150 ft., using a skip-cage combination of 12,000 lb., with 16,000 lb. of ore. It has anti-friction roller bearings, is driven by two G.E. 500-hp., 575-rpm. d.c. motors.

Highland-Surprise Co., northern Idaho, has improved the operating

efficiency of its hoisting plant by equipping it with up-to-date Westinghouse d.c.-operated control board and dynamic brake.

Two new single-drum utility hoists have been added to its line by the Joy company. They are portable, powered with piston-type reversing motors, and have an ingenious automatic brake. They are intended for handling supplies in stopes and many other similar applications around a mine.

G. L. Saunders, Toronto, in designing a new bottom-opening skip (*E&MJ*, Dec., 1949, page 96) claims to have several advantages over the conventional or Kimberly type.

Good Air Makes Better Workers

Air-conditioning and Refrigeration. Such equipment is involved in the trend of higher wage rates and higher costs, according to L. L. Lewis, vice president, Carrier Corporation, inasmuch as its use will enable a workman to do more work with less fatigue and proneness to accident. For example, in certain deep or hot mines, further rises could bring the operation up to its break-even point, and the disappearing point of profits would be reached. Increasing wage rates and costs of plant and machinery are making investments in worker efficiency and welfare more and more profitable.

Bunker Hill & Sullivan, Idaho, now has three spot coolers installed. Very useful advantages are said to be obtained in shaft sinking, driving large raises or shaft raising, and in advanced blind headings.

Portable blowers in 1, 3 and 5-hp. sizes have been added to the Joy company's ventilation line. They are equipped with either electric or air power.

Pumping Economy. As a result of equipping pumps on all levels for automatic starting, one pumpman now does the work formerly done by three at the Buffalo-Ankerite mine, Ontario. M. Florence is superintendent.

Victaulic couplings are being used widely to good advantage in underground pipe systems.

Modern Materials. Aluminum alloys are being used for safety hoods for shaft inspection, drill columns, arms and shells at a Sudbury district property. An all-aluminum-alloy timber truck is in service. Scaling bars of aluminum alloy has been found serviceable in barring loose rock.

A ROLLER-CONE-TYPE BIT is used in this rotary drill, developed after several years of field experience. Cuttings are cleared with compressed air.

Surface Drilling

Toward Better Churn Drilling. Experimental work with a tungsten-carbide-insert churn-drill bit appears to point the way to saving in sharpening and transporting churn-drill bits, according to the management of an open-pit copper mine in the Southwest.

Kennametal, Inc., Latrobe, Pa., has produced a so-called "chopping" or Samson-type bit that has been used for structure drilling on the Mesabi. The cutting edge is set with six cemented carbide inserts that give a longer bit life by the ratio of about 50 to 1. Inserts can be replaced by brazing if they are destroyed. The most common size is 2⅞-in. diameter. The bit is 11¼ in. long and sells for $20 to $30, depending upon quantity.

Various open-pit operators in the Iron Country are changing from 6-in. holes to 9-in. holes with wider spacing. Drilling and blasting costs are reduced and good fragmentation is maintained. The tendency is to replace present Bucyrus-Erie 27-T and 29-T drills with 42-T machines, for heavy drilling only.

Joy's new 58-BH rotary blast-hole drill, which uses a roller-cone-type bit, became available in the third quarter and several are now in service. Normally it puts down a 6¼-in. hole to any depth required. It is self-propelled on crawler-treads, driven by diesel-engine, gasoline engine, or electric motor. Claim is made that it will drill 15 ft. or more per hour in hard, dense dolomite and 30 ft. per hour in ordinary cement limestone. This machine incorporates the results of several years of field experience in applying rotary drilling methods to blast-hole work. The original installations used circulating water for clearing the cuttings, but recently the substitution of compressed air has given excellent results. The change not only makes the drill suitable for use where water supply has been a problem but makes it an all-season rig.

A drill for boring horizontal holes 16 to 30 in. in diameter for air courses, water courses and entry work in hardpan, shale and slate has been introduced by Salem Tool Co., Salem, Ill. The machine has bored a 24-in. hole as far as 120 ft. horizontally. It was originally developed for open-pit work.

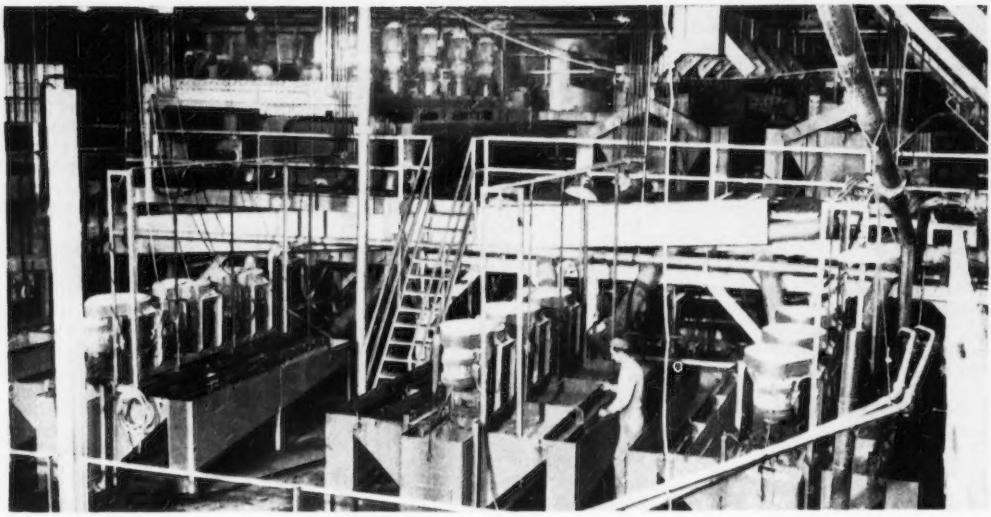
An Iron Country operator has developed a complete drill unit mounted on a steel platform with a hydraulic collapsible mast. It affords greater mobility, saves time in moving to another hole, particularly for shallow holes.

It appears that economics in exploration drilling can be effected through use of the so-called mud drill. The hole is first drilled through surface glacial drift. Casing is then set and drilling continued with a standard diamond drill or Mesabi-type structure drill.

At an open-pit mine in Canada churn-drill bits of nickel-chromium-molybdenum alloy steel are in service.

Working on Core Drilling Standards. Standardization of diamond-coring equipment is progressing under the guidance of the Diamond Core Drill Manufacturers Association, according to Patrick Adamson, chairman of the publicity committee. Core barrels larger than NX are now standardized throughout, with exception of the arrangements of bearings and a few details. Parts from one manufacturer will fit parts made by another. This also applies to the "M" series, which has been available to industry for over a year. This type of barrel has certain advantages. During the past year the E. J. Longyear Co. has been working on improvements.

The Association is still working on standardization of drill rods in Canada and the United States. U. S. manufacturers have gone along with Canadian sizes in EX and AX and the Canadians seem willing to adopt the United States BX and NX sizes.



FLOTATION OF NON-METALLICS sets the pace on automatic controls, new reagents, and processes. This is International Minerals & Chemical Co.'s new potash plant in New Mexico. Sylvite (KCl) floats; NaCl doesn't.

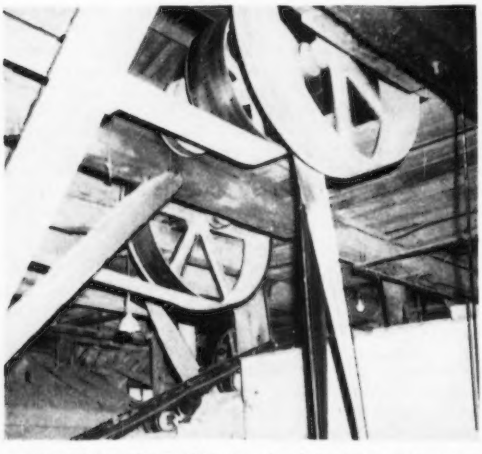
Iron Ore Beneficiation Leads

WHEN THE BOTTOM TEMPORARILY fell out of the metal markets last spring, it seemed to put a definite brake on the progress in mineral dressing that has been so obvious these past few years. Several interesting developments on which reports were due this year have failed to materialize.

The emphasis, of course, has been on cost reduction all year, and several expansion or research programs have had to be slowed up or shelved entirely. Nevertheless, milling is still going ahead at an encouraging rate, and there is, as always, more to talk about than there is space for in a review such as this.

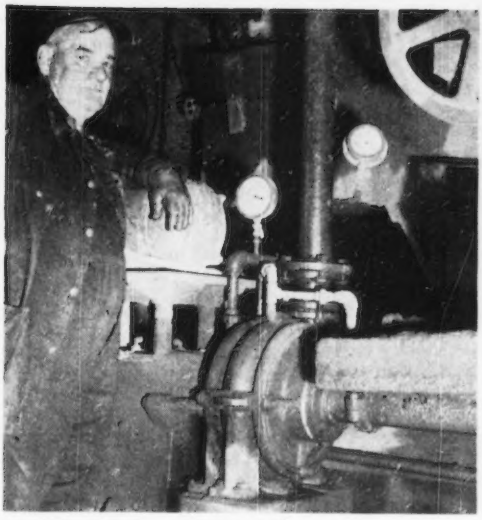
Jack Myers' 9x11-ft. Tricone ball mill down at Tennessee Copper continues to hold the spotlight. It represents a departure from standard practice in so many ways that a book might well be written as a result of tests with it. It is the industry's outstanding example of a large, slow-speed overflow ball mill using small balls to grind a 10-mesh feed to flotation size.

Actually size, alone, is not what

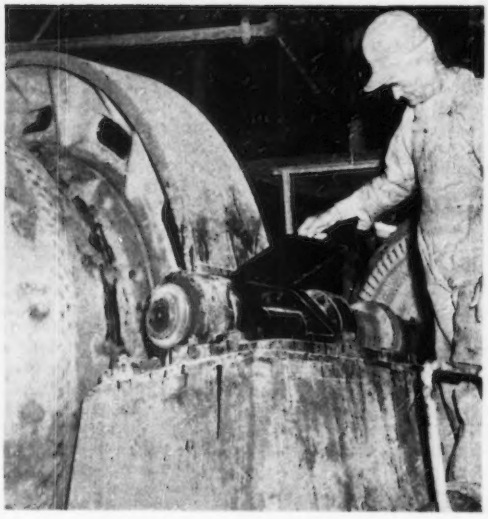


GONE ARE THE DAYS, for flat belt drives like these, being replaced this year in a Western mill by motors.

TENNIS-BALL MOUNTING shields balance from heavy crushing plant vibration. H. Erwin, Eagle-Picher, did it.



CLASSIFIER OVERFLOW is pumped to flotation at 44% solids in the Sidney. Charles Stallcup checks Hydroseal.



QUIETEST BALL MILL (Sidney's) checked by Earl Reynolds. Flash grind (E&MJ), Jan. 1950) is used here.

Advance in Milling

Jack is after. He has found that chemical reactions in the mill are quite as important in affecting the final result in the flotation cells, which is where the pay-off is made. Jack has assured himself of the power saving he was after by installing the large mill. The job ahead of him is to learn more about the unknown reactions he has set up with the special conditions he has established.

The Aerofall mill, a distant relative in appearance at least of the old Hadsell mill, is getting a lot of attention. It uses the rock itself as the grinding medium, helped out by an ultra-hard grinding medium of the metal carbide type.

Rod composition has never been given much study, but it looks as though the rising interest in rod mills as coarse grinders will lead to the same sort of study for rods as has been given ball composition.

Time-honored practice in the Coeur d'Alene has been to grind those lead and zinc ores as fine as paint. Bunker Hill has lately found that to be unnecessary. Frank McKinley, in *E&MJ* for January, 1950, told how the new "flash grind" technique works. Bunker Hill and its neighbor, the Sidney, now ram the raw ore through the primary mill, float out what they can, and re-grind only those portions of the ore that need it. The result is less slimed sulphides, better separation, and better recoveries all around.

Mill liners are trending definitely in the high alloy direction. Utaloy, Ni-hard, and special manganese steels appear ever more frequently in reports from the field. Among those using or testing Ni-hard for liners, for example, are Ajo, Tennessee Copper, Castle Dome, Morenci, Golden Manitou, Paymaster Con, Sherritt Gordon, and several other Canadian operators.

Classifying

The Bird centrifuge steadily increases its field of application, particularly in the non-metallics industry. Down in New Mexico, it is helping refine potash, but desliming is still its principal use.

Several mills are returning to the old Esperanza-type classifier for fine-size separations. Bunker Hill, the Sidney, and Magma Copper Co. are the latest to take it up. F. T. Davis (*E&MJ*, Oct., 1949) says the Magma classifier gives better control at lower cost than former equipment. Its range is limited, however.

The Dorr Co.'s "Hydroscillator" is more or less of an open secret. Jack Myers has been testing one for some time at Copperhill, which he described at the Columbus meeting of the AIME. The new machine is designed to give an improved separation, particularly at fine sizes.

Vibrating screens keep reaching down into the finer sizes, too. Reports come in of attempts to use screens for separations at 100 mesh and even finer. Such things are commonplace in other industries, but are new to mining. Mechanically, screens are being improved with rubber mountings and better drives. Allis-Chalmers announced a new screen with a deck sloping at progressively flatter angles from the feed end. The idea is to vary speed of travel in keeping with depth of bed.

Deister Concentrator Co. has a new SuperSorter, a large-capacity hydraulic classifier used for splitting fairly fine feeds into several fractions for subsequent treatment. It has thus far been used for coal and for sand, but it is expected to enter large-tonnage fields like phosphate rock and iron ore.

Use of automatic controls is widening steadily, although not at the rate that seemed likely a year or so ago. Automatic pH control is fairly commonplace, and grinding

circuit control turns up here and there. Wayne Gould reports good results with a Foxboro control unit out at Sunshine, and, of course, Carl Marquardt continues to work miracles with his own controllers at Pioche and Bauer in Utah. With automatic density control a proven fact, and with automatic control and recording of pH from every point of interest in the mill, an operator at Bauer (Combined Metals Reduction Co.) needs only an automatic reagent feeder and a Craig Rice mystery to make the shift pass pleasantly indeed.

Sink and Float

The advantage of using heavy density processes to cut grinding costs is becoming apparent to more operators all the time. Consolidated Mining & Smelting Co. of Canada started up its new Sink-Float plant last year and reports that it is working out very well. It removes waste rock from the lead-zinc ore at a coarse size. Down in Africa, Premier Diamond mines is installing an enormous Heavy-Media plant to concentrate diamonds out of the Kimberly blue ground.

It is rumored that one of the southwestern coppers is thinking of trying out sink and float methods as a badly-needed cost cutter.

Up in the iron country, progress in Heavy-Media work takes the form of new vessels for separation and new applications for old ones. The North Uno plant of Pacific Isle Mining Co. has been using a Mobil-Mill to raise a 44% iron feed to about 53%. The ore came from several old mines and density of the medium had to be varied constantly between about 2.80 and 3.35. The company also found that Humphreys spirals did well on minus 1/16-in. plus 80-mesh material.

Spirals have also done well treating wastes from mica washing operations down in North Carolina. On a waste containing 18% mica, the spirals, without circulating middlings, have recovered 70% of the mica in a 70 to 90% concentrate. Further tests will be made.

Jigs are surging right back into the ore dressing picture, this time into the iron ore field. The James jig now finds itself with an offspring, the "Jimmy" jig, announced late last year. Pan American jigs are now offered by the Dorr Co.

Down in Africa, T. Haden, of Bulawayo, has built a mechanized strake for gold recovery. It is an endless rubber belt, the top surface of which is riffled. It simply moves up a slope, without shaking at all, and water flows down over it. When the belt passes over the top pulley the concentrate is washed out. Like the Denver-Buckman tilting table, it is a mechanical, automatic way of clearing riffles, which, as everybody knows, are good only for the first few hours of operation after cleaning.

Slowly, and from several directions, investigators are creeping up on the secret of flotation machine operation. Most interesting last year was an AIME paper by Tuwiner and Korman that described their evidence of the existence of a coating formed on chalcocite particles in a pulp that interfered with flotation of the mineral unless agitation in the pulp was sufficiently violent to rub the coating off. This would explain why, in tests years ago at Morenci, the mechanical machines, for the most part, made a better recovery than the pneumatic machines. But it does not explain why two of the mechanical machines, both of which put all the pulp right through the impeller zone to each cell, failed to equal the recovery of the simplest pneumatic cell. If agitation is the essence, why didn't these machines make a good tailing? Actually, the machine that made the best tailing was of the hog-trough type, although it did give the pulp the most violent treatment of any machine in the mill. We are still treating this problem like the three blind men who set about describing the elephant.

The Dutch State cyclone, taken over by American Cyanamid Co., is undergoing tests, both as a thickener and as a concentrating device. Its chief usefulness has thus far been in the coal field. Interestingly, James A. Barr, in investigating the phosphate field for this review, found a cyclone that for 25 years or more has been giving good service as a classifier in the Federal Chemical Co.'s phosphate washer at Ridley, Tenn. F. L. Smidth makes it.

New Flotation Plant

American Cyanamid has opened a new flotation plant for phosphate rock in the Florida pebble field. Washer undersize is deslimed in Dutch cyclones and sized in Dorr sizers. The coarse fractions get an agglomerative float on belt flotation machines of the Coronet type (*E&MJ*, Dec., 1942). The fine sizes get a straight lime-fatty acid float, followed by an amine float.

A novel feature of the Cyanamid plant is a 700-ft. thickener for settling plant overflows. An earth bank with a paved road on top forms the periphery. A Dorr rake mechanism of much smaller diameter is located in the center of the pond. The road is used to handle a cable drag attached to one of the rake arms. This serves to rake down material that builds up around the edge of the pond.

Iron Ore Treatment Holds Most Attention

As research programs on taconites dig deeper it becomes apparent that more exacting studies will be made to determine how much beneficiation will be practicable. It is now generally accepted that the silica content of iron ore concentrates should be lowered to 12% or less. In many cases this involves extremely fine grinding and quite expensive beneficiation methods. If the silica restrictions could be relaxed to allow, say, 15% silica, then simpler, more economical beneficiation methods might be used in some cases. Determination of accurate cost figures for the removal of a unit of silica at the blast furnace is a project which will receive steadily increasing attention. The Oliver Iron Mining Co. already has such a project in operation.

Interest is still running high in the "magnetic-roasting" of iron ores to convert the non-magnetic iron minerals to magnetic form. Preliminary estimates tend to show that plant cost would be extremely high per ton of capacity, but there are hopes that improvements in roasting methods may yet lower the cost of magnetic roasting to a point where it can be considered as an accessory process in the beneficiation of the non-magnetic taconites. Evidence of the amount of research effort being expended in this direction can be seen in the steadily growing list of patents re the roasting of iron ores.

The seventh iron ore research laboratory to be opened on the iron ranges was placed in operation by The Cleveland-Cliffs Iron Co. at Ishpeming, Mich., during the summer of 1949.

Renewed interest in the development of more efficient magnetic separators is evident. Advances by electrical engineers in improving methods of generating and controlling magnetic fields have been helpful to designers of magnetic separation equipment. New separators are now being readied for use on the magnetic taconites of Minnesota

and foreign magnetic ores. The processing of progressively finer iron ores by magnetic methods has driven home the fact that there is a definite need for (1) improvements in control of magnetic separators, and (2) better demagnetizing methods. Our Norwegian friends in the taconite business have recognized these two problems some years ago and have expended considerable research work on these phases of magnetic beneficiation. The fact that very finely ground magnetite is more difficult to demagnetize than coarser particles has long been recognized. The present stage of demagnetization studies is to attempt to apply known laboratory methods to commercial scale operation.

Flotation Promising

Flotation still looms on the horizon as a favorable process for iron ore concentration. It is a high-cost method, but at the same time is a method with considerable background and involves little risk as to its success when and if it is applied to iron ore concentration. Methods such as magnetic-roasting and chemical beneficiation methods may yield extremely high purity concentrates and very high recoveries, but extrapolation from laboratory or even pilot-scale to commercial production plants involves pioneering on a big scale. Application of flotation from laboratory to commercial scale can be done accurately and with every assurance of satisfactory results. One commercial flotation plant is planned to treat a specular hematite ore in Michigan. The nature of this special type ore apparently makes flotation possible without the use of the large quantities of reagents necessary for most iron ores. One hope for increased use of flotation in the processing of iron ores is the battle shaping up in the chemical industry toward lower prices for various organic chemicals, some of which are used as flotation reagents. Spectacular successes in new and improved chemical plants may pave the way to lower flotation reagent cost. There is little hope of drastically decreasing the cost or greatly increasing the efficiency of present day flotation cells, but a downward trend in the cost of reagents is definitely possible and would be of great help in pushing flotation into the iron ore field.

Heavy-Media separation is continuing to increase in popularity as a method of beneficiating "intermediate" iron ores on the Mesabi Range. The annual capacity of iron ore Heavy-Media plants in operation or under construction during 1949 is estimated at over seven million tons. A Mobil-Mill Heavy-Media plant was placed in service at the Grant Mine of Inter-State Iron Company during the 1949 season. Inter-State also plans to convert part of the Hill-Annex Washing Plant to Heavy-Media for the 1950 season. A Mobil-Mill was placed in service on the Gogebic Range in Michigan late in the season, but operations were still in the tune-up stage when cold weather moved in and the plant was shut down until the 1950 season. The outstanding development of the year in the Heavy-Media field on the iron ranges was the introduction of more efficient separatory vessels. The Hardinge Heavy-Media Separator has been enthusiastically received and claims several improvements over existing separators. Ease of starting up after a shut-down and greatly reduced power consumption are among the improvements claimed. There is also evidence that the upper size limits of Heavy-Media separation will be extended in the near future. At present the top size of iron ore particle in the feed is 1¼ to 1½ inches, but new developments may extend this to 4 to 6 inches.

Fine Sizes Tested

Concentration of iron ores by the Heavy-Media process is limited to ore particles coarser than ⅛ inch. Those ores which contain a considerable proportion of values in the minum ⅛-inch size require additional treatment. A large proportion of the experimental work in progress in the pilot plants on the Mesabi Range is directed toward treatment of these finer sizes. Humphreys spiral plants are continuing to treat substantial tonnages on the Range, but a new factor affecting the use of spirals has appeared on the scene. This is the possibility that there is a serious abrasion problem when spirals are used on iron ores. Several years operation of spirals on Florida beach sands failed to show any serious wear problems, but two seasons of operation on iron ores, which are much coarser than the beach sands, has turned up the fact that spiral surfaces can be rapidly abraded by certain ores. One plant reports that channels as deep as ¼-inch have appeared in the spiral surfaces. It is too early to predict how much these channels affect the metallurgy of the spirals, but The Humphreys Investment Company is already offering an all-rubber spiral in attempts to overcome the wear problem.

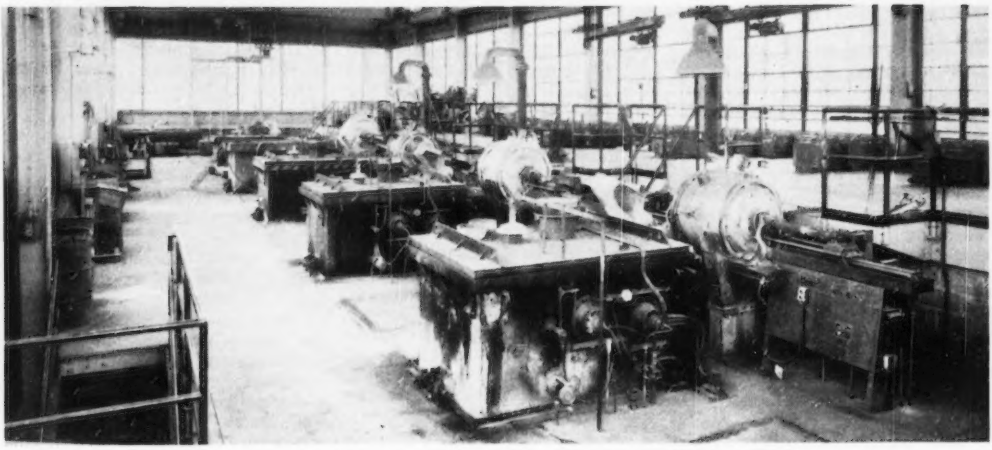
Abrasion Grinding

A unique process being utilized in the preparation of intermediate iron ores for subsequent concentration is that of "abrasion grinding." This operation consists of a "quick" grind of iron ores which have much of their silica loosely attached to the particle surfaces. The abrasion grinding step serves to "scuff-off" the loosely attached silica with the net result of liberating middling particles to such an extent that when such particles report in the final concentrates they do not increase the silica content of the concentrates to an objectionable extent. Abrasion grinding is accomplished at two plants by using ball mills charged with two-inch balls, a grate discharge, chute-type feeders, and extremely high feed rates.

A new jig plant began operations in May 1949 at the Missabe Mountain stockpile, Virginia, Minn. Mr. Charles H. Remer, vice president of the Charleson Iron Mining Company, has developed the new jig used in the plant. The operation has a capacity of one thousand tons of concentrate per 24 hours. The crude iron ore from the stockpile averages about 45% iron and is graded up to a concentrate containing about 55% iron and 14.5% silica.

The Driessen Cyclone has been undergoing extensive tests on the Mesabi range. The machine has been operated with a magnetite medium and has given encouraging results. Present testwork has been on minus 3/16-in., plus 65-mesh feed. Detailed accounts of cyclone performance are not yet available, but the machine looms as a contender in the race for equipment to treat the finer sizes of ore not amenable to Heavy-Media separation.

The problem of agglomerating fine-sized iron ore concentrates still claims its rightful share of interest and research. It is fortunate that thus far there has not been much duplication of effort in this field. The Erie Mining Company has continued active in its research and development of the pelletizing process. Research on certain Southern ores indicates that briquetting is applicable in some cases. The sintering process is continuing to demand considerable attention.



1. CONTINUOUS CASTING of copper base alloys has been developed at AS&R's Perth Amboy plant. Melting furnaces on top floor feed casting furnaces where molten metal enters mold chamber to be cast into variety of shapes.

1949 Was a Year of Progress in

A. W. SCHLECHTEN, Professor of Metallurgy, Missouri School of Mines and Metallurgy, Rolla, Mo.

A SURVEY OF NON-FERROUS metallurgy for 1949 shows that there has been great activity during the year and that many important developments of the past few years have been described for the first time. The reviewer is faced with the problem of trying to include all of the worthwhile material that is available within the bounds of one article.

Titanium

The publicity campaign for titanium has reached such a stage that popular magazines are carrying articles on the wonder metal. One imaginative newspaper writer states that steelmakers are "worried sick" by the threat of competition. Despite the flood of semi-technical articles, very little new metallurgical information has been released in the past year. This does not mean that there is not an immense amount of investigation being carried on; one source estimates that $10 million has been spent on titanium research in the past three years.

A series of papers on titanium was presented at a meeting sponsored by the Office of Naval Research and these are now available in bound form. Other papers were given at the meeting of the American Chemical Society last September.

Spectacular development of the Quebec Iron and Titanium Corp. is progressing. Construction work at both the mine and smelter site is under way. A standard gage railway, approximately 27 miles in length, is being pushed to reach the first orebody in time to start initial mining operations by August, 1950. Ore mined in the Allard Lake area will be transported over this railroad to Havre Saint Pierre and shipped by boat to the smelter site at Sorel, approximately 50 miles east of Montreal. The smelter is to have a 1,500-ton-per-day capacity and it is planned that the first furnace will be placed in operation during October, 1950.

Electric smelting of ilmenite will produce a pig iron and a slag with a high TiO_2 content. The slag will be treated to recover the titanium dioxide for use in pigments; it will also serve as a raw material for titanium metal production if and when the demand for the metal increases.

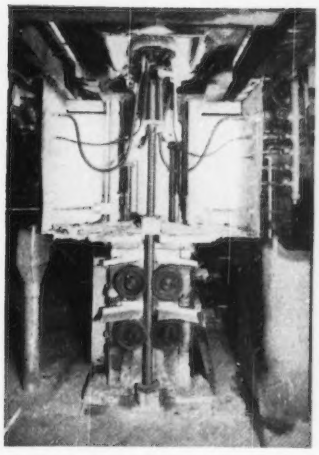
In the regular smelting of iron ores, high titanium slags have a reputation for being viscous and difficult to handle. Research by Armant and Cole, of the National Lead Co., indicates that this thickening is caused by the formation of lower valence Ti compounds. Pilot plant scale smelting tests on ilmenite from Tahawus and Canada have shown that if reducing conditions in the furnace are not too severe, fluid slags are obtained, although some iron escapes to the slag. Additions of limestone and dolomite fluxes are made to the smelting charge so that a slag running 62-69% TiO_2 will carry 5 to 11% MgO and 9 to 13% CaO.

A Method for the Slags

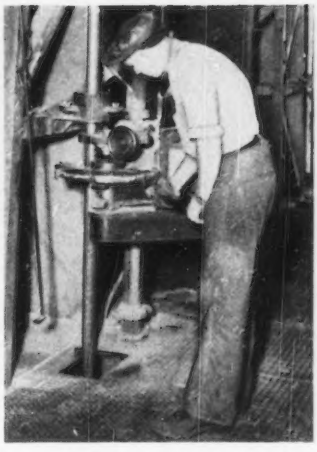
Such slags can be treated by the customary method of dissolution in acid, removal of impurities by crystallization, and recovery of the TiO_2 by hydrolysis of the solution.

As yet, no satisfactory method has been demonstrated for producing ductile titanium from TiO_2. Although the Dominion Magnesium Co. announced about a year and a half ago that they had such a process, no details have been released. The U. S. Bureau of Mines and du Pont use the Kroll process, wherein $TiCl_4$ is reduced with magnesium.

$TiCl_4$ can be made by chlorinating mixtures of TiO_2 and C; rutile and carbon or ilmenite and carbon mixtures are also chlorinated, although there is consumption of chlorine by formation of iron chloride, silicon chloride, and other im-



2. ROLL DRIVE regulates speed of water-cooled casting to floor below.



3. CUT-OFF SAW travels with casting, cutting it into desired length.

Non-Ferrous Metallurgy

purities which must be separated from the final product.

Unfortunately, titanium, which is worth only a few cents a pound as ilmenite, costs in the neighborhood of $1 per lb. in the tetrachloride. With view to finding a cheaper source of $TiCl_4$, Knickerbocker, Gorski, Kenworthy and Starliper have made tests in which low-grade rutile concentrates are smelted with pyrite to give a titanium matte. The resulting matte can be chlorinated at 150 deg. C. to 250 deg. C., which is easier to handle than the 700 deg. C. or more required for the chlorination of the oxide. One difficulty is the formation of a sulphur chloride which accompanies the titanium chloride and requires a special treatment for removal.

The Kroll Process

The production of titanium by the Kroll process in furnaces with a capacity of 100 lb. has been described by Wartman. An important development is the practice of tapping molten magnesium chloride from the furnace before the end of the run so as to expose the remaining magnesium metal for further reaction with the titanium chloride. It is possible that reduction furnaces cannot be increased much more in capacity without a change in design. With the present type of furnace, difficulty is experienced in dissipating the heat evolved by the exothermic reduction reaction. If the furnace gets too hot, the magnesium vaporizes so that the reaction with the titanium chloride occurs in the vapor state near the top of the furnace. The resulting product is a finely divided impure material not suitable for further treatment. In addition, there will be danger of the formation of a low melting point titanium-iron eutectic which will contaminate the product. It can be seen that reduction with sodium, the Hunter process, would suffer even more from this difficulty because of the lower boiling point of sodium.

The Bureau of Mines continues to fabricate titanium by powder metallurgy methods, and Long has described a method of enclosing the powder in an iron sheath so that upon rolling, the powder is compacted and the sheet is rolled in one operation.

Titanium as Sponge

Du Pont titanium is in the form of a sponge resulting from the vacuum distillation of $MgCl_2$ and excess magnesium away from the reaction product. The resulting sponge must be melted, and the first difficulty is to find a suitable refractory material for a crucible; all of the oxides react with molten titanium, and the only one of any value is thorium oxide, which is too expensive for large-scale work.

Graphite crucibles can be used without excessive carbon pick-up if the molten titanium is not held too long in the hot crucible. An induction-heated graphite crucible with provision for bottom casting has been described by Sutton of du Pont. It is rumored that titanium ingots weighing as much as 600 lb. have been melted and cast from several of these units operated in parallel.

Kroll favors a vacuum furnace in which the graphite crucible is heated by a split-tube graphite resistor; this type of furnace was originally described by Kroll, Schlechten and Yerkes in the Transactions of the Electrochemical Society. The same type of furnace is used by the P. M. Mallory Co. for the production of titanium alloys.

A third method of melting is the vacuum or controlled-atmosphere arc furnace. Originally designed by von Bolton, it has been perfected by Kroll and by the Battelle Memorial Institute. The titanium is melted in a water-cooled copper vessel by an arc struck against the metal from a tungsten tipped top electrode. Successive additions of sponge must be added to build up a large ingot.

Oxidizes at Red Heat

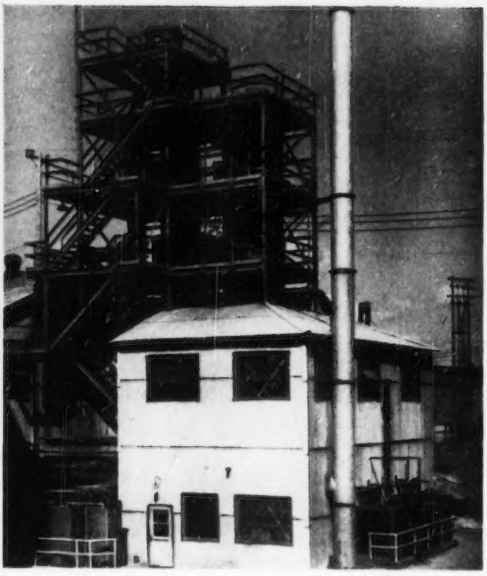
Despite its high melting point, titanium cannot be heated to a red heat in air without surface oxidation. Nevertheless, the present practice is to hot forge and hot roll large ingots at temperatures of 800 deg. C. to 950 deg. C. The oxide layer formed is quite tenacious and does not penetrate too far into the metal.

The effects of alloying additions on titanium are being investigated by many organizations, but very few results have been reported. Battelle found that beneficial effects on physical properties were obtained from carbon, oxygen, nitrogen, molybdenum, tungsten, and chromium. P. M. Mallory Co. reports that additions of boron, vanadium, tungsten, iron, manganese-silicon, and aluminum-chromium improve the mechanical properties.

Zirconium

While titanium receives the publicity, a very similar metal, zirconium, is being developed with less fanfare. A series of papers by Kroll and co-workers of the Bureau

TITANIUM INGOT is removed from the furnace. Research in titanium metal continued unabated in 1949.



LIQUID SO_2 PLANT, Selby, Cal., produces 20 tons a day on a commercial basis from heretofore waste gases.

of Mines describes the production of this other so-called rare metal which is not really rare.

With a density of 7.5, zirconium is heavier than titanium, but its corrosion resistance is even greater. Samples placed in boiling hydrochloric or boiling nitric acids were unaffected. The production methods are much the same as for titanium except in the details of the reduction furnace. Zirconium chloride is a solid at room temperature and it must be vaporized before one undertakes to reduce it by magnesium. We can expect to hear more of zirconium in future articles.

Copper

Construction of new copper smelting facilities at Ajo and Chuquicamata, plus many changes and additions at other plants, continues, but very few details are available for publication. Foley Brothers, in charge of construction, have erected 600 houses for employees at Chuquicamata. Machinery for the new plant will be knocked down for shipment and assembled at the site because of the limited loading facilities that are available at Antofagasta.

At Ajo, plans call for one reverb, two converters, and one anode furnace. Rumor has it that a deep bath will be maintained in the reverb and that concentrates, charged with a sand slinger, will be dried sufficiently by hot gases so that there will be no great stream evolution when they hit the bath. Other rumors tell of water cooled copper jackets on the sides and possibly side burners. Phelps Dodge Corporation will spend $500,000 to improve the New Cornelia milling installation.

A new reverb will be built at Hurley by Kennecott as a part of the $2-million improvement of mine, mill, and smelter installation. Anaconda will add a new copper billet casting department at Great Falls as a part of a $1,800,000 program. The new anode casting plant at Garfield represents a $3,500,000 investment by A. S. & R. This will supply anodes for the new $15,000,000 Kennecott refinery which was 60% complete as of Nov. 1; the 1,346 cells were in place and furnace foundations are being prepared.

More Capacity for Ray

The Hayden Smelter is expanding its facilities to take care of the increased output from Ray. A new 13x30-ft. converter with rings on the ends will be added as well as a new turbo blower and a new turbo generator. At Magma the smelter has been shut down for repairs and improvements. For some years the roasters have been used only for drying the concentrates; now it is planned to feed the concentrates directly to the reverb.

Operations at Morenci

An article by L. L. McDaniel gives details of present-day operation at Morenci. It is interesting to read of the difficulties encountered at this most modern of smelters and the solution of the problems. For example, the concentrate was at times too wet to move in the vibrating feeders above the reverbs and it was necessary to replace these with drag conveyors.

Reverbs were originally equipped with multiple jet burners, but these were difficult to keep clean because of explosions in the furnace which plugged the burner ports with charge and slag. High-pressure burners entering the bridge wall through large pipes were substituted and are said to have given less trouble and at the same time are more efficient and give better control.

Some trouble was experienced with magnetite building up on the furnace bottoms, so two piles of quartzite are maintained in the furnace near the discharge of the converter slag launders. This has

helped control the accumulation of magnetite.

W. B. Boggs in a paper before the Empire Mining and Metallurgical Congress discusses some modern developments in copper pyrometallurgy. Among other things, he points out the causes of magnetite formation in the converter and methods of minimizing it. He takes particular exception to the practice of tapping matter near the firing end of the reverb and states that this is one of the causes for accumulation of magnetite on the furnace bottom.

Mr. Boggs traces the improvement of reverberatory practice and tells of the furnace at Noranda which in 1945 smelted an average of 2,052 tons per day exclusive of liquid converter slag. He believes that a furnace could be built that would smelt about 3,000 tons of charge per day.

Flash Smelting for Inco

Developments at International Nickel Co. include a "flash smelting" plant. Sudbury daily papers describe this as a process which will combine pyrrhotite and commercial oxygen to produce fuel which will replace coal in all Inco's smelting operations. We presume that this means that the heat of roasting in an oxygen-enriched atmosphere will be utilized to smelt the calcine.

A proposal for "flash smelting" is the subject of Canadian Patent No. 451,735 issued to Bryk and Ryselin. A method is claimed for smelting sulphide bearing, especially copper or nickel, materials, such as flotation concentrate so that a product in liquid state is obtained. The raw material and oxidizing air flow downward in the same direction. Flue gas is used to preheat the air, and extra fuel can be added in the form of pyrite. This process is being used successfully at Outokumpu Oy in Finland, in a new smelter having a daily capacity of 350 metric tons, where Mr. Bryk is metallurgical manager.

Lead

A number of papers presented before the AIME give the details of recent improvements in lead metallurgy. One of the most interesting is a detailed presentation of sintering practice at Selby, where the D-L gases are recirculated to bring up the SO_2 content to 5 or 6%. Gases from both the "first-over" and "second-over" machines are concentrated in this fashion and are subsequently used in a contact acid plant or for making liquid sulphur dioxide.

At Port Pirie plans are under way for the construction of a contact acid plant to operate on D-L gases. At the same plant experimental work has shown that finer crushing of preroast eliminates the need for coke in the sinter charge, but gas temperatures are lowered to the point where condensation occurs in the flue and baghouse. Sulphur content of the sinter made from the finely crushed preroast was the same, but the sinter appeared to be denser.

Herculaneum smelter is adding additional sintering facilities including a 72-in. machine. Present practice is to make a preroast sinter, which is stored, and then to switch to a finished roast on the same machines. The new arrangement will have the preroast machines, a cooling table, crushing and sizing equipment, and the final roast all in a single continuous flow sheet.

One of the new features of blast furnace operation is the report from Trail that additions of oxygen to give 23% oxygen in the blast air result in an increased furnace capacity of 15 to 20% and a reduction in the amount of coke consumed.

Port Pirie is breaking and sizing all coke to the blast furnace, and they have found that high peaks in the lead assay of the slag have been eliminated. Daily screen analyses of the coke to the blast furnace are being plotted against percent lead in the slag and general furnace performance to establish an optimum coke grading.

High Copper in Lead BF

The effect of high copper on the operation of a lead-blast furnace has been discussed by A. A. Collins in a recent paper. He believes that Cu in the charge has some beneficial effect in making a better sinter and prolonging the life of the bags in the baghouse. However, the troubles resulting from clogging of the lead well, increased dross, and cost of working up the dross outweigh the advantages, in Mr. Collins' opinion. He recommends that copper be eliminated in the milling.

Some years ago Mr. John S. Stewart suggested that present lead blast furnaces are upside down, at least as far as the bosh is concerned. His idea of an inverted bosh has been tried out with a resulting increase in capacity of the furnace; only 9.8% coke was used versus 25.5% before the change. The furnace in question was used for melting copper scrap, but the facts might apply equally well to a lead furnace.

Feddersen and Lee have reviewed the methods used in recovering cadmium in lead smelting. Usually the blast furnace fume is recirculated until the cadmium reaches 3 to 6%. This fume can be leached directly or further concentrated by smelting with silica or by roasting, after which it is leached. Cadmium is precipitated from solution with zinc slabs or zinc dust and the resulting sponge distilled in retorts. Subsequent refining with either zinc chloride or ammonium chloride may be necessitated to remove thallium.

At Port Pirie the continuous softener furnace slag is being smelted with soda ash and crushed charcoal for the direct production of antimonial lead.

Continuous Softening Here

As an example of the exchange of ideas, the Port Pirie continuous softening process is being tried out at Bunker Hill and Monterrey, and in turn Port Pirie is investigating the American practice of smelting copper-lead drosses with soda ash in a reverberatory. They are also experimenting with vacuum dezincing similar to the method developed at Herculaneum and also used at Selby. Whether or not the vacuum dezincing can be incorporated into a continuous unit has not been revealed; theoretically it seems possible.

A recent article in *Engineering & Mining Journal* suggests that a vacuum furnace could be used for the treatment of the zinc skims from desilverization. Both zinc and lead could be vaporized and the cupellation operation eliminated if the skims did not contain too great an amount of non-volatile impurities. Dust and fume losses would be reduced and there would be no rich litharge to be returned to the blast furnace.

The new El Paso slag fuming plant has been described by T. J. Woodside. Similar in plan to the Bunker Hill plant, this new installation is treating 20,000 tons per month of current and dump slag. The slag charged runs about 13% zinc which is reduced to 1.8% giving a calculated recovery of 89.2%. Lead is reduced from 0.8 to 0.03%. The resulting fume is

deleaded by roasting in rotary kilns with the addition of a small amount of coke breeze. The deleaded fume runs 76% zinc and 2% lead.

A new slag fuming furnace is to be built at Trail. It will have a capacity of 500 tons per day of blast furnace slag running 17% zinc and 3% lead. This is a second unit, as the first fuming furnace has been in operation many years. R. R. McNaughton reports that additions of oxygen to the fuming furnace increases its capacity and improves the zinc recovery.

Zinc

The proper method of desulphurizing zinc concentrates seems to be a debatable matter. Forster in a discussion of autogenous roasting at Risdon cites the good work of multiple hearth furnaces and doubts whether they will be outmoded by flash roasters. However, at Palmerton the New Jersey Zinc Co. has installed a new flash roaster with a capacity of 250 tons per day; this is probably the largest flash roaster in existence. The drying hearths are at the bottom, so that the shaft carrying the rabble arms does not extend into the upper part of the furnace. This plant also has a new 72-in. sintering machine which is said to have a capacity of 600 tons per day.

At Blackwell, Oklahoma, tests have been made on sintering raw concentrates. As a result, plans have been made to construct a sintering plant with one large machine 168 ft. long and 12 ft. wide over the windboxes—the largest machine, both as to length and width, ever constructed. The capacity will be 600 tons of raw concentrate per day. It is believed that this installation will have the advantages of lower cost, greater cadmium elimination, and will produce a more uniform and desirable sinter. The plant is expected to be ready for operation in the latter part of this year.

Changes at Avonmouth

The sintering of raw concentrates at Avonmouth at the ratio of 5 to 1 is still in effect, however, some changes are contemplated in the near future. The gases from the sintering operation are used for manufacturing acid. Details of practice at Avonmouth are given by S. W. K. Morgan in a paper that has been published by the Fourth Empire Mining and Metallurgical Congress.

The Dorr Co. has made an extended series of experiments on the roasting of zinc concentrates by the FluoSolids process. They have successfully produced a sweet roast suitable for leaching and also a partial roast with view to subsequent sintering. The advantages of the process are close control of temperature and regulation of gas composition. SO_2 concentrations up to 14 percent can be obtained if desired. Other data on FluoSolids will appear in an early issue.

The development of the modern zinc retort in the United States has been traced by Page and Lee. They conclude that the length is limited by manual charging and the diameter by heat penetration. In a comparison of silicon-carbide and silica-flour retorts, silicon carbide has 3 to 4 times the life and has better heat conductivity, but costs 4 to 6 times as much and must be heated in a reducing atmosphere. The silica flour retorts are easily corroded by iron slags and are especially sensitive to thermal shock. In discussing this paper, S. W. K. Morgan pointed out that neither silica flour nor silicon carbide retorts have been adopted in England. It is probable that the fireclay available to them is superior to that which is used in the United States and is therefore entirely satisfactory for the purpose of retort manufacture without silica flour additions.

Cut Retort Drying Losses

At Donora the controlled drying of retorts in an atmosphere of progressively decreasing relative humidity and increasing temperature reduced the drying cycle from 45 days to 4. The losses in the drying room were less than 1%, which is only one half of the usual loss. The furnace life of the quick dried retorts is as good as that of the retorts that are dried by the older method.

The last of the horizontal retort furnaces at Palmerton will be replaced by additional vertical retorts, but down in the natural gas country the horizontal retorts are far from finished. At the Bartlesville plant a new block of furnaces was built during 1949 to replace two old and smaller blocks. The new unit with 832 retorts will handle 50 tons of sintered charge per 48-hour cycle. At Amarillo progress has been made with mechanical charging of the retorts, and at Dumas a new rod mill has been installed whose sole purpose is for mixing the charge to the retorts.

The New Jersey Zinc Co. has developed and put into operation a new type of condenser for continuous retorts. A motor-driven graphite impeller inside the condenser throws a spray of molten zinc which scrubs the vapor stream. The condenser has an internal volume of 28 cu. ft. and will condense 10 tons of zinc per day. Cooling pipes in the zinc hold the temperature at 500 deg. and the conditions are such that formation of both physical and chemical blue powder are avoided.

The St. Joseph Lead Co. is testing various designs of the Weaton-Najarian condenser. One unit has condensed as much as 50 tons per day, although regular production is reported to be in the neighborhood of 30 to 40 tons.

Induction furnaces are, or at least have been, used in Germany and Italy for the melting of zinc. Risdon plans to install a 540-kw. induction furnace that will melt 118 tons per day. They hope to increase the melting efficiency by 1 to 1½%. Some objection has been made in this country to employing induction furnaces for zinc melting on the grounds that dross accumulation would block the narrow channels around the core.

Continuous Zinc Coating

Several plants are experimenting on methods of continuous casting of zinc. Suggestions have been made to use pyrex or silicon carbide pipes as siphons from the melting furnace. Dams placed in the front part of the mold could retain a considerable part of the dross and reduce or eliminate the necessity of skimming.

S. W. K. Morgan has given some additional details concerning the reflux refining of zinc. His paper shows the metal circulation through the columns and the amount of reflux both in the lead and cadmium columns. Analyses are given of the metal produced at various stages of the refluxing process.

Of interest to many metallurgists is the collection of papers entitled, *The Physical Chemistry of Process Metallurgy*, published by the Faraday Society. Included are many theoretical considerations that may well be the basis for a better understanding of the fundamentals of metal extraction and refining. As our methods grow in complexity we must know the underlying principles and not rely excessively on empirical data.

MARKETS—Trends and Prices (*Continued from page 69*)

Zinc Ore Production by Countries

Production of zinc ore, in terms of metal content, by important sources of supply. Countries missing are Russia, Yugoslavia, Peru, and the Belgian Congo. The figures, compiled by the American Bureau of Metal Statistics, are in short tons.

	May	June	July	Aug.	Sept.	Oct.
United States (a)	54,791	53,599	40,614	45,033	41,863	37,988
Canada (b)	20,866	24,102	20,344	22,215	22,475	.....
Newfoundland	3.599	3,330	2,525	2,603	3,630	3,046
Mexico (c)	18,036	17,784	16,546	18,229	16,436	17,617
Argentina	1,067	1,077	915	816	822	.....
Bolivia	1,463	1,246	1,216	1,128	1,254	1,497
Germany (Bizone)	4,492	4,536	5,115	5,035	.....	.....
Germany (Fr. Zone)	487	488	650	767	.....	.....
Italy	7,290	6,871	7,511	7,198	7,489	7,470
Spain (h)	4,963	4,370	4,937	3,835	2,407	4,603
Sweden (d)	6,375	5,002	1,500	2 506	3 069	2,832
Australia (f)	18,272	18 397	18,306	17.622	21,170	19.032
Japan	3,899	4,343	4,239	4,095	4,242	4,189
North Africa (g)	1,491	897	885	.....	.....	.....
Southwest Africa	1,144	1.132	798	1,269	951	802
Rhodesia (e)	2 201	2,094	2.178	2,206	2,145	2,128
Totals	150,436	149,268	128,281	.....	.....	.....

(a) As reported by U. S. Bureau of Mines. (b) New refined zinc plus zinc in ores exported; revised to exclude Newfoundland. (c) Production of zinc concentrates by flotation and a relatively small amount of calamine. (d) Estimated content of exports. (e) Slab zinc equivalent. (f) Gross zinc content of copper, lead and zinc concentrates. (g) Algeria, Tunis and Morocco. (h) Partly estimated.

Official London Prices

Though trading in tin on the London Metal Exchange has been resumed, beginning with Nov. 15, the British Ministry of Supply continues to fix delivered prices of copper, lead, and zinc for the United Kingdom. Quotations in effect on the last day of January were as follows:

	Per Long Ton £	s.	d.
COPPER:			
Electrolytic, high conductivity	153	0	0
Fire refined, high conductivity	153	0	0
Fire refined, high grade	152	10	0
Fire refined, min. 99.7 percent	152	0	0
Fire refined, min. 99.2 percent	151	10	0
Hot rolled black wire rods	159	0	0
LEAD:			
Soft, foreign duty paid	97	0	0
Soft, Empire	97	0	0
English, refined	98	10	0
ZINC:			
Foreign (G.o.b.) duty paid	85	10	0
Domestic (G.o.b.)	85	10	0
Prime Western and debased	85	10	0
Refined and electrolytic	86	5	0
Minimum 99.99 percent	87	15	0

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

(January 21, 1950)

Aluminum, ingot, 99 plus percent, lb. (base price)	17c.
Antimony, spot, lb., 5 tons and up but less than carload, in cases	32.030
Bismuth, ton lots, lb.	**$2.00**
Cadmium, commercial sticks, delivered, lb.	$2.00
Calcium, lb., ton lots, 98 percent, cast	$2.95
Chromium, 97 percent grade, lb., contract	$1.07
Cobalt, 97 to 99 percent, per lb.	$1.80
Indium, troy oz.	$2.25
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	40c.
Magnesium, 99.8 per cent, carloads, lb., producer's plant	20½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation, wholesale lots) troy oz.	$69.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$71.00
Selenium, 99.5 percent, lb.	$2.00
Silicon, minimum 97 percent, spot, carloads, lb.	16.50c.
Tellurium, lb.	**$1.75 nom.**
Thallium, 100 lb. or more, lb.	**$15.00**
Titanium, 96 to 98 percent, lb.	$5.00

(a) Includes U. S. duty

METALLIC ORES

Beryllium Ore, imported, 8 to 12% BeO, per unit	$26.00@$30.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry 48% Cr_2O_3, 2.8 to 1 ratio	$35.00
48% Cr_2O_3, 3 to 1 ratio	$37.50@$38.50
Iron ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$8.10
Mesabi bessemer	$7.85
Old Range non-bessemer	$7.95
Mesabi, non-bessemer	$7.70
Lead (Galena), 80 percent, Joplin, Mo., ton	$147.67
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese subject to premiums and penalties, 74@76c., c.i.f. U. S. ports, duty extra.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	54c.
Tantalite, 60% concentrate, per lb.	$2.00@$2.75
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, duty paid	$17.50@$18.00
Domestic, scheelite, 60 percent and upward	nom.
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	**27½c.**
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$55.00

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	5½c.
Cobalt Oxide, 72%, metallurgical grade, per lb. of Co	$1.95
Copper Sulphate, 100 lb.	$7.06

ALLOYS

Beryllium Copper, 4 percent Be, per lb. of contained Be	$24.50
Ferrochrome, 65 to 69 percent, per lb. of Cr contained	20.50c.
Ferromanganese, 78 to 82 percent, gross ton, seaboard	$172.00
Ferromolybdenum, 55 to 65 percent Mo, lb. of Mo. contained	$1.13
Ferrosilicon, 50 percent, per lb. of contained Si	11.3c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$2.25
Ferrovanadium, per lb. of V delivered	$2.90
Silicomanganese, 1½ percent C, per lb. contracts	8.95c.
Spiegeleisen, per long ton, 19@21%	$65.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$960@$1,050
Crude No. 2	$492@$550
Spinning fibers	$232@$475
Shingle fibers	$95.50@$141
Paper stock	$78.50@$88
Waste	$58
Shorts	$27@$52
Vermont, f.o.b. Hyde Park:	
Shingle stock	$97.00@$107.00
Paper stock	$68.50@$85.00
Waste	$51.00
Refuse or shorts	$25.50@$46.50
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$11.50@$12.00
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$9.00@$9.50
Bauxite, long ton:	
Domestic, crude, 50 to 52 percent (not dried)	$4.00@$5.06
Domestic, chemical, 55 to 58 percent	(a)$8.50@$9.50
Domestic, abrasive, 80 to 84 percent	$18.00@$18.50
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, airfloated bulk	$8.50@$9.50
North Carolina ceramic grade	$18.00@$20.00
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh	$18.50
Glass spar, white, 20 mesh	$11.75@$12.50
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois, 70% effective, CaF_2, ton	$37.00
Acid 97% concentrate, bulk, ton	$42.50
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$30.50@$31.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	(a)12@14c
Sulphur, Texas, mines, long ton	$18.00
Talc, f.o.b. works, ton:	
New York, purified	$18.50@$20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50

(a) Nominal

IRON AND STEEL

Pig iron, gross ton, basic, Valley furnaces	$46.00
Steel, f.o.b., Pittsburgh billets, net ton	**$52.00**
Structural shapes, 100 lb.	**$3.40**

WASHINGTON REFLECTIONS

McGraw-Hill Washington News Bureau

Percentage Depletion In For Over-haul This Year. Treasury Favors Subsidies

The subject of percentage depletion allowances for the minerals industry has been getting considerable attention from the Treasury Department and the Bureau of Internal Revenue not to mention Truman, himself.

Moves in Congress last fall to bring all mineral producers under percentage depletion touched off a behind-the-scenes attempt by the Administration to crack down, especially on rates that it believes too high. Congressmen argued back that it is unfair to give the allowance to some people and exclude others. To this, Treasury has to agree.

"But," said Administration tax experts, "it is also unfair to give one producer a 27½% allowance, another 23%, yet another only 5%, and the majority a 15% deduction."

That's where the horse trading will start. It is a political fact that the lobby for the oil and gas interests can form a Congressional road block to any Administration drive to whittle oil's extra-high allowances. It is also a fact that the coal states' Congressmen, and those from districts where non-metallics now get no allowance at all, can bring a lot of pressure to bear. Coal people want to increase their allowance from 5% to the 15% level. Others want to get in at that point, too.

Thus, as the President echoes his Administration's thinking in wanting to eliminate "some of the inequities" in the tax structure, one line of attack will be toward the high depletion allowances now being allowed. Tax experts point out that for oil and gas alone the loss in revenue is in the neighborhood of half-a-billion dollars. Any increase handed to coal, and other non-metallics will just swell the amount the Government is not receiving in tax revenues. And in these times of deficit financing, the Administration is going all out to increase, rather than decrease, revenues.

Political experts in Washington do not believe that any Administration attempt to whittle these allowances will be permitted by Congress. But they also say that there is very heavy pressure for spreading the allowance out and increasing it. With these two forces at work, a trade could be made.

Sen. Walter F. George of Georgia, chairman of the all-important Senate Finance Committee, said late last year that he thought it "quite possible to trade the Administration out of some tax rates and out of certain taxes because the Administration is going to need to get more money. In getting more money, I think certain of these inequitable taxes should be removed."

It was not altogether clear what the "inequitable taxes" the Senator referred to were, but at the time he was talking about depletion allowances, and the idea of adding to the allowance list.

Another tax benefit that the oil and gas producers enjoy, the authority to charge off drilling costs against revenue, has now also come under Administration attack. None of the other mineral producers are allowed to do this, so there will not be the backing of all industry in a fight to prevent elimination of this charge-off.

No Income to Tax

Another very important political point was brought out recently during discussion on taxation between representatives of the Administration and the Congress. Treasury experts brought out a survey of mining taxes and demonstrated that out of 867 returns only about a quarter had a net income. The rest of the companies, some 645, were in the red.

These disclosures by the Administration were used in an argument against the idea of "tax help for the mining industry." Any tax help handed out would only help the big integrated concerns, and again cut into the main source of tax revenue, the experts said.

When asked what, then, could be done, taxwise, to help the "little fellow" the answer was "nothing—a subsidy is the only thing that could be used to bring them into a taxable position."

This was the first real indication that the Administration would allow a subsidy in lieu of a tax incentive. From a money standpoint, the Government experts argue that it would cost considerably less to subsidize small mining enterprises than to design reductions in tax restrictions which would benefit the entire industry. The subsidy would cost about $80,000,000 a year, some of which would come back to the Government in metals or in repayments for successful exploration projects. Also, the idea has a national defense angle in that it keeps important mineral properties in standby condition pending the time that a national emergency would call for their output. An amendment to the tax structure which benefits both large and small, however, would cost hundreds of millions of dollars, the experts say.

The Administration's dislike for the depletion allowance is nothing new. The coming fight over increases or cut-backs on Capitol Hill this year is likely to produce a new twist, however.

Iron Ore Unloading Docks For Baltimore

The probability that Big Steel will establish a new production center on the East Coast, coupled with the growing demand for foreign ores, has lead the Baltimore & Ohio Railroad to build a $5,000,000 ore unloading facility near Baltimore.

Although the railroad only points to the advantages of fast and cheap movement of foreign iron, manganese and chrome ores from the coast to big plants in Ohio and Pennsylvania, it has been common knowledge for some time that U. S. Steel has purchased a plant site near Philadelphia, and other big steel companies are "looking around."

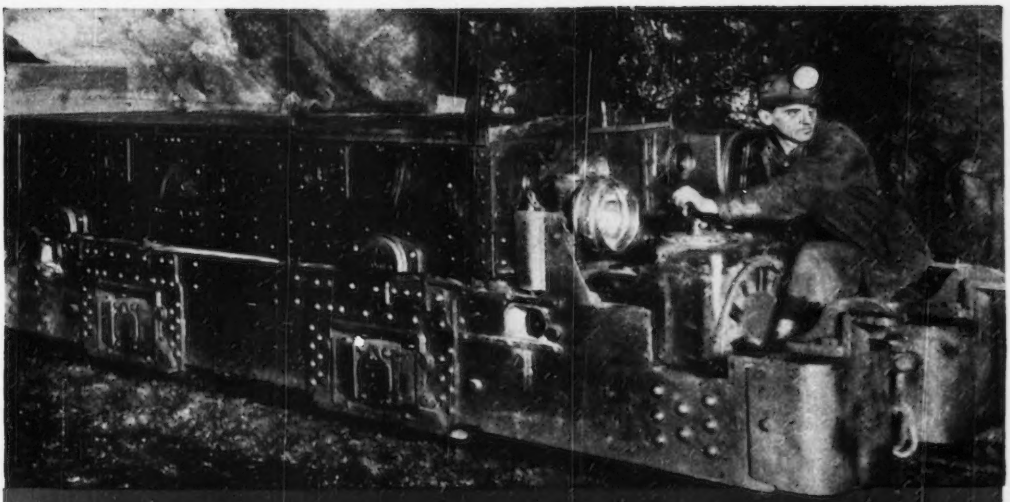
The new facility will be equipped with ore unloading rigs of the latest design. A belt conveyor will transport the ores to a battery of hoppers constructed over loading tracks. The loading operations will be controlled electrically by automatic and semi-automatic devices. Rated capacity of the facility will be approximately 3,000 tons per hour initially. The entire layout has been designed to allow a doubling of capacity when justified by increased volume of imports.

Metal, Mineral Output Off Slightly In 1949

Minerals and metals worth $13,900,000,000 were produced in the United States last year. This was an 11% drop from the record year of 1948, but was still the second greatest in history, according to the Bureau of Mines.

Non-metallics was the only major mineral group that equalled the 1948 production high. New records were set by building materials, with increases noted for cement, sand, gravel and stone, vermiculite, pumice, and perlite. Production of gypsum and heavy clays declined.

Metals dropped 15% in dollar output during the year, mainly because of the steel and smelter strikes and the break in non-ferrous prices. Lead production, however, showed an in-



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SAFE DEPENDABLE POWER

1888 . . . DEPENDABLE BATTERIES FOR 62 YEARS . . . 1950

crease over 1948. Pig iron shipments showed a 13% decrease, though iron ore prices were approximately 17% above the 1948 level. Shipments of ferro-alloys slumped 29% from the previous year. Mine shipments of manganese dropped 12%, tungsten 28%, and molybdenum 22%.

Phosphate rock and potash shipments approximated those in 1948. The major chemical raw materials, sulphur, salt, and lime, declined somewhat from the all-time high reached in 1948. Domestic shipments of fluorspar declined 31%. Supplies of soda ash exceeded demand for the first time in many years and consequently the production of natural sodium carbonate declined sharply.

Considerable interest was aroused in domestic deposits of monazite during the year due to the difficulties of obtaining adequate supplies from foreign sources. Bauxite mining declined by 25% in 1949. Demand for primary magnesium increased substantially during the year. Commercial development of titanium metals and alloys during the year was outstanding, and prospects for mining in this field are improving.

A slightly lower mine production of gold was principally in the by-product segment of the industry, and attributable to lower prices for base metals. Silver mine output dropped 11%, but the Bureau of Mines attributes this to the strike at the Bunker Hill and Sullivan smelter.

Mercury mining early in 1949 was at such a low ebb that output for the year was expected to be the smallest in a century. The reopening of a major Nevada mercury mine during the latter half of the year helped slow the decline. Cadmium metal refining during the year was at a peacetime high.

How Wage-Hour Law May Affect Engineers

Higher salary standards which have to be met in order to exempt administrative, professional and executive employees from the overtime provisions of the Federal wage-hour law went into effect on Jan. 25, the same day the 75c. minimum and other amendments passed by Congress last year became law.

The new salary tests, described in detail in Part 541 of the wage-hour administrator's regulations, provide that in addition to performing duties normally associated with the positions, administrative and professional employees must earn at least $75 a week and executives at least $55 a week.

A concession is also made with regard to workers in these categories who earn at least $100 a week. The administrator will not be as strict as to the amount of time spent by the employee in work that is not exempt from overtime pay requirements.

A detailed explanation of these so-called "white-collar" exemptions is contained in a 28-page printed bulletin available from the U. S. Government Printing Office. Its title: "Explanatory Bulletin—Regulations Part 541."

Salary equivalents of the 75c. hourly minimum, which employers may use as a guide for their salaried employees covered by the law, have been announced as $30 a week, $65 semi-monthly and $130 monthly.

Curbs against use of child labor have been stiffened. Previously, it was illegal only to ship goods in interstate commerce within 30 days after child labor had been employed. Now, with certain exceptions employment of child labor is directly prohibited in commerce as well as in production of goods for commerce.

Children under 16 may not be employed in any mining occupations. Minors of 16 and 17 may be employed on jobs which have not been declared by the secretary of labor to be hazardous.

The Portal-to-Portal Act of 1947 remains on the books. The "overtime on overtime" ban passed by Congress earlier last year is incorporated in the amended wage-hour law (Fair Labor Standards Act of 1938).

Government Can Sue

There has been an important change as to enforcement. For the first time, the wage-hour administrator is given authority to sue employers for wages due employees under either the minimum wage or the overtime provision.

The administrator may "supervise" the recovery of back wages or, on written request of the affected employee, he may file suit in court. In either case, the employee waives his right to file his own suit or to seek liquidated (double) damages. Individuals may still file their own suits and obtain liquidated damages as well as reasonable attorney fees.

The courts may limit the recovery of liquidated damages from employers found to have acted in "good faith." Also, those who act in "good faith" in accordance with a ruling or interpretation of the administrator may use that as a proper defense against any liability or punishment for violating the law.

Injunctions may be obtained by the administrator against continuation of a violation.

Employers may be prosecuted for willful violation of the law. Maximum fine is $10,000. For a second offense, a six-month prison term may be imposed.

The administrator has distributed a poster outlining the terms of the amended law. All employers are required to exhibit the poster in a convenient place where it can be read by workers covered by the law.

An official digest of the law was sent out with the poster. Copies may be obtained from any wage-hour office.

NLRB Blocks Mine, Mill Come-Back At Hillsboro

The Mine, Mill and Smelter Workers' attempt to work its way back into the American Zinc Co.'s zinc oxide plant at Hillsboro, Ill., has been blocked by the National Labor Relations Board.

NLRB has put its approval on a two-year contract signed by American Zinc last August with Local 1201 of the AFL Hod Carriers Union, successor to Mine-Mill Local 418. The agreement runs until Aug. 31, 1951.

Local 418 withdrew from Mine-Mill and surrendered its charter last Aug. 1, almost a year after Mine-Mill struck this and other American Zinc plants. Within a few days, Local 418 members voted to affiliate with the AFL union and were chartered as Local 1201.

A few days later, on Aug. 9, Mine-Mill officials filed non-Communist affidavits, complying with the Taft-Hartley law, and at the same time petitioned NLRB for an election at the Hillsboro plant.

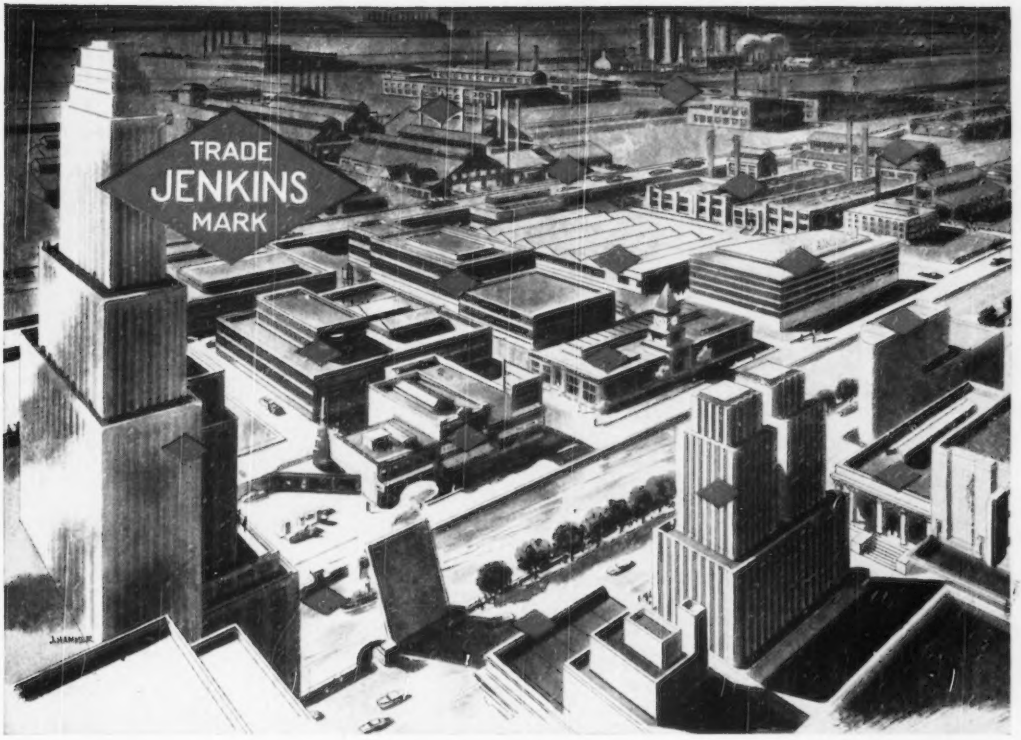
On Aug. 11, just two days later, American Zinc signed the two-year agreement without official knowledge that Mine-Mill was seeking bargaining rights. NLRB did not apprise the company of the petition until August 22.

The company and the AFL contended before NLRB that their contract stood as a bar to any election sought by Mine-Mill. Mine-Mill, on the other hand, argued that the contract should not be recognized because it was signed two days after Mine-Mill petitioned for the election.

NLRB ruled against Mine-Mill, but for an entirely different reason. It held the Mine-Mill election petition to be invalid, and dismissed it because it was filed prematurely—within a year after an election had been held at the plant involving an independent union, United Zinc Oxide Workers. Taft-Hartley does not allow more than one election a year.

The election, to which the company consented, was held in December, 1948, during the strike. The independent union failed to get a majority and the strike continued. Mine-Mill, not on the ballot because it was not in compliance with Taft-Hartley, had urged "no union" vote.

By last August, however, the strikers had had enough. They disaffiliated with Mine-Mill, tied up with the AFL, and got themselves a two-year contract that Mine-Mill can't upset.



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PERSONAL NEWS

Charles T. S. Parsons, comptroller for the Utah Copper Division, Kennecott Copper Corp., retired Jan. 1. A native of Salt Lake City, he first became affiliated with the old Utah Copper Co. He became division comptroller in 1943. **George A. Soutter**, chief accountant at the Salt Lake City office accounting department of the division succeeds him.

Robert H. Ridgway, formerly with U. S. Vanadium Co., is now with the U. S. Bureau of Mines, Washington, D. C., in charge of ferrous minerals for the Minerals Division.

CHARLES R. COX, president of Carnegie-Illinois Steel Corp., subsidiary of United States Steel Corp., has resigned to become president of Kennecott Copper Corp. He succeeds the late *E. T. Stannard*, who recently died in an airplane accident in Canada. Mr. Cox was born in Schenectady, N. Y., in 1891. He was educated at New York University and began his business career in 1914 as a public accountant. Before joining the steel corporation, he served during World War I with the United States Shipping Board Emergency Fleet Corporation and from 1920 to 1930 he was with the Crucible Steel Company of America. Mr. Cox became president of Carnegie-Illinois in 1936, after serving as president of the National Tube Co. for three years. He was awarded the "Certificate of Merit" for his outstanding services during the recent war in increasing the production both of steel and of finished products.

John B. Dorsh, editor of *Mining World* for the past two years, has resigned to accept work with the U. S. Bureau of Mines.

John G. Baragwanath, formerly with Freeport Sulphur Co., has become vice president of the Shelter Rock Development Corp. in charge of its mining and petroleum activities. His headquarters are at 485 Madison Ave., New York City.

Howland Bancroft has returned to his New York headquarters after having spent the past seven months in South Africa investigating developments in the gold fields of the Orange Free State.

Keith C. Stansmore, assistant manager of the foreign division of The Dorr Co., returned to the United States on Dec. 17 from a three-month trip to Australia. He visited many of the mining districts and the firm of Hobart Duff Pty., Ltd., in Melbourne, the Dorr company's representative in Australia and New Zealand.

Robert W. Pullen, of Butte, Mont., senior in mining engineering at Montana School of Mines, has been given the $500 award offered by the American Smelting & Refining Co. for high scholastic standing.

H. L. Garrity, superintendent of mines for the Utah Copper Division of Kennecott Copper Corp., has been named general superintendent of operations with headquarters in Salt Lake City. **L. F. Pett**, mine superintendent at the Bingham open-pit mine, was named his successor.

Harold J. Hull, Wallace, Idaho, was elected president of the Northwest Mining Association at the annual meeting in Spokane. **E. C. Stephens**, manager of the Spokane office of Anaconda Copper Mining Co., was chosen vice president; **E. K. Barnes**, Spokane, was re-elected treasurer, and **Roger O. Oscarson** was re-elected secretary.

Dr. Arthur A. Center, consulting engineer of San Francisco, has been given a certificate as a professional engineer in chemical engineering by the State of California.

Charles E. Stott, deputy director, strategic materials division, ECA, returned to Washington recently after completing an extensive trip through Africa. Mr. Stott headed a reconnaissance mineral survey through the principal mining districts of Kenya, Uganda, Tanganyika, Northern Rhodesia, Southern Rhodesia and French Equatorial Africa. The trip was sanctioned by British and French colonial government offices and carried out in cooperation with the respective African governments. **Lewis Ferguson**, ECA consultant, and **George Guillotte** of the ECA mission to London, accompanied Mr. Stott through British East Africa and the Rhodesias. **Enzo DeChatelat**, of ECA in Paris, and **Roger Vaurs**, of the French Foreign Office in Paris, joined the survey in French Equatorial Africa.

Wilson T. Lundy, vice president of Freeport Sulphur Co., has retired. He will continue as a member of the board of directors and will be available in a consulting capacity. Mr. Lundy joined Freeport in 1923, after participating as a mining engineer in mining enterprises both in the United States and abroad. He became general manager in 1930 and was elected a vice president the same year. In 1941, when he was elected a director, he went from the company's New Orleans operating headquarters to the New York executive office.

W. Church Holmes has joined the staff of Nichols Engineering & Research Corp. as manager of the special engineering contracts division of the mining and metallurgical department. For the past year he has been in charge of the operations of the sintering machinery company. Prior to that time, he was associated for 12 years with the Sunshine Mining Co. in Idaho. He is a graduate of the Mining School of the University of California.

JOHN K. GUSTAFSON, for the past two years associated with the U. S. Atomic Energy Commission at Washington, D. C., has been appointed consulting geologist to the M. A. Hanna Co. A native of Chicago, he graduated from Washington University, St. Louis, and later received M.A. and Ph.D. degrees at Harvard University. From 1930 to 1934 he was a member of the geological staff of Hollinger Consolidated Gold Mines, Ltd. He then went to Western Australia to conduct the Central Geological Survey's three-year examination of the Broken Hill district for three Australian corporations. In 1939 he was placed in charge of the Toronto office of Hollinger Exploration, Ltd., and from 1944 to 1947 he was associated with Newmont Mining Corp., Magma Copper Co, and affiliated companies, conducting mining activities and making exploration contracts. Dr. Gustafson served as director of the AEC Division of Raw Materials and later as manager of raw materials operations.

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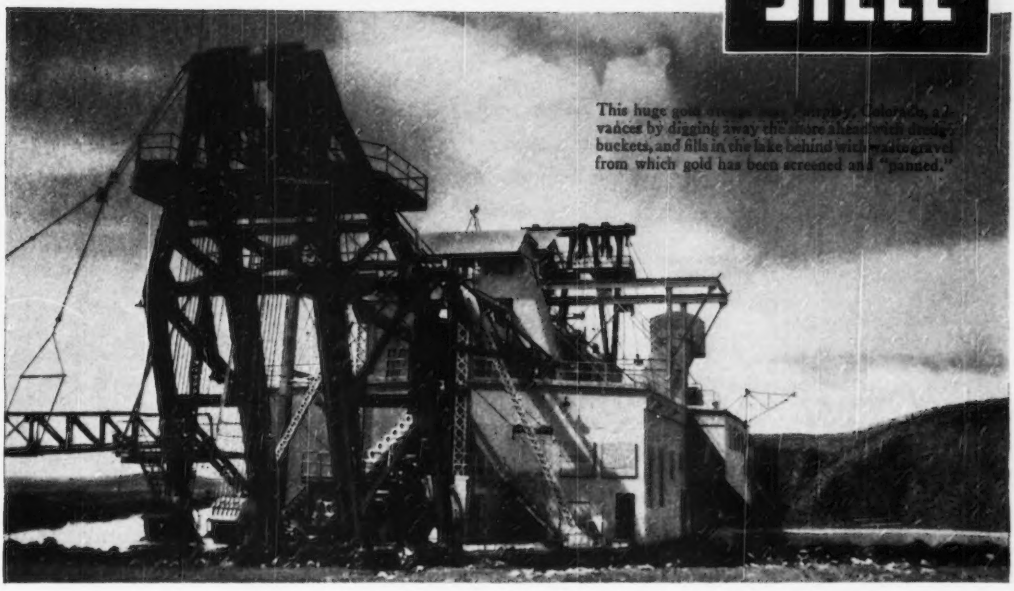

This huge gold dredge ... Fairplay, Colorado, advances by digging away the shore ahead with dredge buckets, and fills in the lake behind with waste gravel from which gold has been screened and "panned."

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More than 4 miles of J&L wire rope is used to operate the $1,000,000 gold dredging boat, illustrated above.

Wire rope raises and lowers the "ladder" of dredge buckets. Others operate the "stackers" that dispose of waste gravel. The boat moves forward by wire rope, and is rotated by wire rope.

Wire rope operates the 45-ton "spud" or anchor on which the boat pivots. This spud, driven into the bottom of the 70-foot lake, supports the boat while dredging. Still more wire rope is used for auxiliary winches.

South Platte Dredging Co., operator of this "Goliath", near Fairplay, Colorado, reports that by comparison, J&L Wire Rope is more dependable, gives longer service life and is more economical.

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SHOWN RECEIVING a $500 scholarship from Dean John P. Spielman, of the Washington State College School of Mines, is Stanley H. Dayton, of Pullman, senior in metallurgical engineering. The presentation was made Dec. 14 in the presence of faculty members. In the group are (left to right) S. A. Duran, Dean Spielman, D. L. Masson, J. F. Williams, Jr., Mr. Dayton, and H. J. Pessl. The scholarship, granted by American Smelting & Refining Co., is given to a junior or senior in the school in recognition of the excellent training in metallurgy the college has been offering since 1891. The recipient is chosen by the mining staff for character, engineering promise and scholastic attainment.

Donald H. McLaughlin, president, Homestake Mining Co., has been named chairman of the subcommittee on metal mining matters of the Natural Resources Committee of the U. S. Chamber of Commerce. The other members are **Evan Just**, editor, *Engineering & Mining Journal:* **Lawrence Litchfield, Jr.**, vice president, Alcoa Mining Co.; **J. C. Kinnear**, vice president, Kennecott Copper Corp.; **F. S. Mulock**, president, U. S. Smelting, Refining & Mining Co. **Richard W. Smith**, assistant manager, Natural Resources Dept., U. S. Chamber of Commerce, was named secretary.

ROBERT C. NORTON was elected chairman of the board of Oglebay Norton & Co. recently to succeed the late *Crispin Oglebay*. A son of the co-founder of the company, he served for many years as vice president and treasurer and was made vice chairman of the board in July, 1949. *Alfred M. Rankin*, a partner in the Cleveland law firm of Thompson, Hine & Flory, has been elected a director.

Thomas B. Reifsnyder, a recent graduate of the Colorado School of Mines, has accepted a position as sales engineer with the International Machinery Co. His address is: % Grace y Cia, Santiago, Chile, S.A.

Jesse Johnson has been appointed manager of the Atomic Energy Commission's Raw Materials Operations Office to succeed **Dr. John K. Gustafson.** Mr. Johnson was graduated from the University of Washington in 1917, having majored in mining engineering. He established his own business as a consulting engineer in 1919. In 1926 he accepted a position with a financial institution, but returned to consulting work when the business was sold. In 1942 he joined the Metals Reserve Co. of the Reconstruction Finance Corporation, serving as chief engineer and deputy director of the Office of Metals Reserve. He joined the AEC in January, 1948.

Fernando Benitez, consulting engineer for the Caja de Credito Minero, Santiago, Chile, in charge of engineering work on the new copper smelter at Paipote, recently organized a banquet for Sr. Gonzalez Videla, president of Chile, and 300 delegates to the mining congress held in December at La Serena. The congress was held under the auspices of the two Chilean mining societies.

E. B. Greene, chairman of the board of Cleveland-Cliffs Iron Co., has announced the retirement of **L. C. Moore**, chief mechanical engineer at Ishpeming headquarters, after 42 years with the company. **R. G. Schaal**, his assistant, succeeds him. **Capt. C. O. Rydholm**, marine superintendent at Cleveland, retired Jan. 1, after 29 years with the company, and was succeeded by **John L. Horton.**

J. P. Norrie, consulting mining engineer for Roan Antelope Copper Mines and Mufulira Copper Mines, Ltd., of Africa, is studying mining districts and methods in the United States.

C. H. Winship, Jr., has been appointed sales manager for Phelps Dodge Corp. and Phelps Dodge Refining Corp. to succeed **Martin H. Crego**, retired. Mr. Winship joined the company in 1946. Prior to World War II, during which he served in the U. S. Navy, he was president of the Haydon Manufacturing Co., Inc.

Roger V. Pierce, general manager of Cate Equipment Co., Salt Lake City, for the past three years, has taken a leave of absence to handle a mining consulting assignment. Mr. Pierce, a graduate in mining engineering of Montana School of Mines, served as special representative of Ingersoll-Rand Co.'s mine hoist and slusher division from 1936 to 1946.

DR. JOHN W. VANDERWILT, consulting geologist and formerly a member of the faculties of the University of Colorado and the School of Mines, has been appointed president of the Colorado School of Mines to succeed *Dr. Ben H. Parker*, who will leave April 1 to accept a position with the Frontier Refining Co. of Denver, with which he was formerly associated. Dr. Vanderwilt, a native of Oskaloosa, La., was graduated from Penn College, University of Michigan, and Harvard University. In addition to his private consulting work, he has been consultant geologist for Climax Molybdenum Co. and has also served on the Board of Experts of the Bureau of Reclamation. During the summer of 1949, he spent three months in Norway, doing geologic consulting under the Marshall Plan.

Fred Simmons, Jr., has been elected chairman of the Delta section of the AIME. Other officers include **J. H. Ramblin, Jr.**, and **E. N. Van Duzee**, vice chairmen; **John Dillon**, secretary; **William T. Ilfrey**, journal secretary; **R. Gregson**, treasurer, and **Earl Kipp** and **H. M. Kraus, Jr.**, directors.

O. A. Rockwell has been appointed

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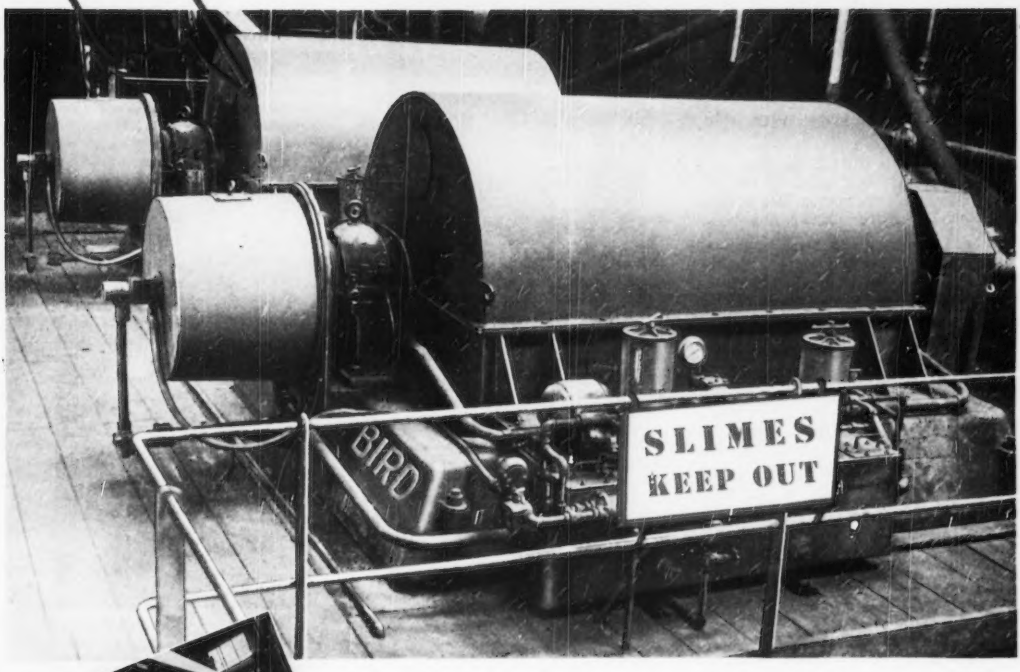

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assistant general manager of the Calumet division of Calumet & Hecla Consolidated Copper Co., according to an announcement by **A. H. Wohlrab**, vice president and general manager. After graduating from Michigan College of Mining & Technology in 1929, Mr. Rockwell was employed by the Montreal Mining Co. as production engineer. In 1936 he joined the staff of Colorado Fuel & Iron Co., and came to Calumet & Hecla in June, 1943, as a mining engineer. **Colin A. Campbell** has been made superintendent of mines in charge of mining operations in Michigan.

Robert M. Hernon is now in active charge of the U.S. Geological Survey's metalliferous work in the Silver City, N. Mex., region. His address is Box 773, Silver City.

Cyril Thomas has been appointed assistant general manager of the Natomas Co. in charge of gold dredging operations. He succeeds **R. G. Smith**, who was named president and general manager following the death of **Thomas McCormack**.

Dr. A. E. Kania has been named chairman of the mining committee of Vancouver, B.C., Board of Trade for the second successive year. He is professor of engineering at the University of British Columbia. **Dr. Desmond Kidd**, consulting geologist and director of Highland Bell, Ltd., was chosen vice chairman of the committee.

Charles Will Wright returned in mid-December from a ten weeks' trip to Greece, Italy, France and Spain. He spent the holidays with his son, **Fred D. Wright**, who has been on mine methods research for the U. S. Bureau of Mines at the oil-shale mine, Rifle, Colo., and who is recovering from two major lung operations at the Fitzsimmons General Hospital in Denver. Mr. Fred Wright expects to return to work within two months.

JOHN B. DE MILLE, consulting engineer of Montreal, Que., Canada, left recently for Rome, where he will spend six months as a consultant for the Economic Cooperation Administration. He will study Italy's mineral resources. Mr. DeMille's address is 62 Via Veneto, Rome, Italy.

Lloyd E. Daume, representative of Southern Minerals & Marketing Corporation Proprietary, newly appointed consulting engineers for Uruwira Minerals, is now headquartered in Johannesburg, South Africa.

ROY B. JOHNS, assistant vice president and sales manager for Freeport Sulphur Co. since 1930, has been elected a vice president of the company. He is a native of Texas, and joined the Freeport organization in 1915.

W. R. Lindsay, consulting engineer of Toronto, has been appointed managing director of Rico Copper Mines. He was resident superintendent of Granby Consolidated at Anyox from 1925 to 1932. He then operated the company's Copper Mountain property at Allenby as resident superintendent and assistant general manager from 1932 to 1941 when he opened a consulting office in Toronto.

Martin H. Crego, manager of sales for Phelps Dodge Corp., retired at the end of 1949 after 57 years of continuous service with the company. **Robert G. Page**, president, was host and toastmaster at a luncheon in December at the Wall Street Club in honor of the occasion. Mr. Crego joined the company as office boy. In 1900 he became associated with the sales department. During World War I he was a member of the Copper Committee in charge of licensing and allocating the metal.

C. T. Ulrich, chief executive of Kennecott Copper Corp., has resigned. He has been made chairman of the executive committee.

Abe Mathews, Jr., has joined the engineering force of the Inter-State Iron Co., at Virginia, as design engineer.

D. M. Chisholm, of Pickands Mather & Co., has been transferred from the Mesabi range to the company's Duluth office.

James R. Stuart, Hibbing, was elected president of the Engineering Club of Northern Minnesota for 1950. **W. P. Wolff**, Hibbing, was elected vice president and **Thomas C. Thielman**, Elcor, secretary-treasurer.

Prof. J. Murray Riddell, head of the department of mining engineering at the Michigan College of Mining & Technology, was the guest speaker at a meeting of the Canadian Institute of Mining & Metallurgy, at Timmins, Ont., in December.

OBITUARIES

Sverre Andrew Nagel, 64, widely known architect and civil and mining engineer of Calumet, Mich., died Nov. 25. He had done much work on the Gogebic and Mesabi ranges with the Hanna, and Pickands, Mather companies. At the time of his death he was design engineer with Calumet & Hecla Consolidated Copper Co.

William Harding Plummer, 77, retired Oliver Iron Mining Co. general superintendent of the Coleraine district of the Mesabi range, died at his home in Two Harbors, Minn., Dec. 17.

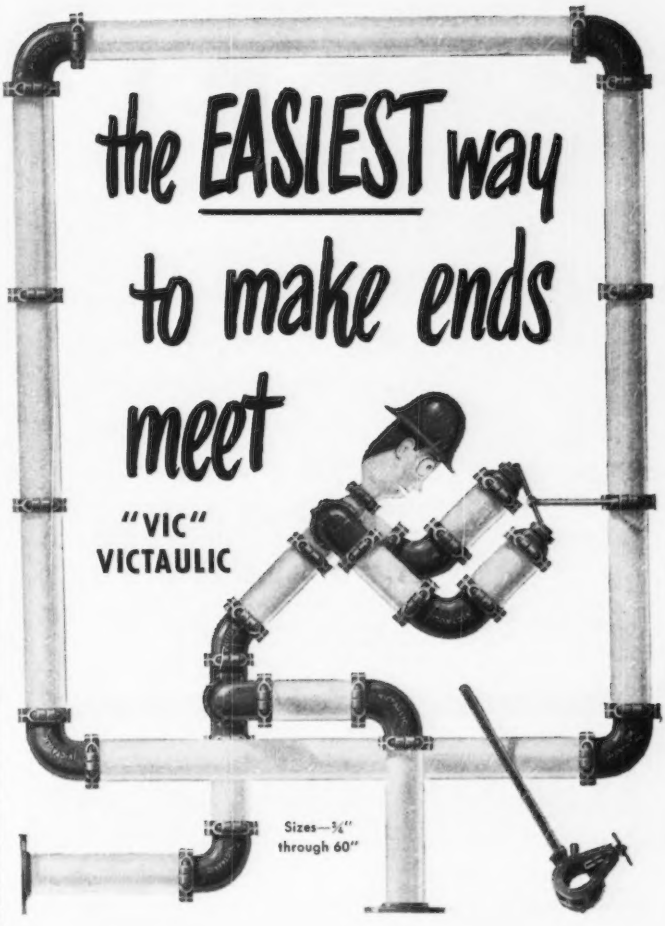
JOSIAH EDWARD SPURR, geologist, and editor of Engineering & Mining Journal from 1919-1927, died Jan. 12 in Winter Park, Fla. He was 79. A native of Gloucester, Mass., he was educated at Harvard University, where he received B.A. and M.A. degrees. In 1901 he served as mining engineer and geologist to the Sultan of Turkey. He was with the U. S. Geological Survey for four years and in 1906 became chief of the geological department, American Smelting & Refining Co. Subsequently, he was associated with Tonopah Mining Co., of Nevada, as vice president in charge of mining; U. S. Bureau of Mines; and Rollins College, as professor of geology. During World War I, Mr. Spurr was a member of the committee on mineral imports, U. S. Shipping and War Trade Boards. He was the author of several books on mining and geology. His best remembered work is *The Ore Magmas*, a book that started widespread, and often heated, discussions on Spurr's theories of ore disposition. In honor of his explorations in Alaska in 1896 and 1898, the U. S. Geological Survey named the peak, Mt. Spurr. He held membership in the Mining & Metallurgical Society of America, of which he was president in 1921; American Institute of Mining & Metallurgical Engineers, and various geological societies.

Selden S. Rogers, superintendent of concentrators at the Anaconda Copper Co. reduction works at Anaconda, Mont., died Jan. 8. He was 64. He was considered one of the nation's authorities on ore dressing and had been with Anaconda in various capacities since 1910.

George Samuel Rice, retired chief mining engineer of the U. S. Bureau of Mines, died at Washington Sanitarium in Takoma Park, Md., Jan. 3. He was born in Claremont, N. H., in 1866, and had two decades of mining experience behind him when in 1908 he joined the Technologic Branch of the U. S. Geological Survey to investigate the causes of coalmine explosions. When the Bureau of Mines was established two years later, he became chief mining engineer. In 1912, Dr. Rice organized the first international conference of mine safety research investigators. When the Holland Vehicular Tunnel between New York and New Jersey was being built in 1919, he participated in ventilation tests and studies. He was a member of the AIME.

Dr. Isaiah Bowman, president emeritus of Johns Hopkins University, and one of the world's leading geographers died Jan. 6 in Baltimore. He was 71. He was born in Waterloo, Ont., but shortly after his birth the family moved to Michigan. He was educated at Ypsilanti (Mich.) Normal College, Harvard, and Yale Universities. During his lifetime he received 14 honorary degrees, eight gold medals and was the author of 14 books. He became the foremost authority on political geography in the country and was considered the most efficient coordinator of topography, population pressures and economic resources in the world. During the first World War he was a member of the American delegation to negotiate the Treaty of Versailles, and in World War II he was invaluable as an adviser to the Department of State. He was made president of Johns Hopkins 15 years ago. In tribute to him, Gov. William Preston Lane, of Maryland, stated, "Not only the state but the nation has lost one of its most valued citizens. His untiring public service made our country a better place in which to live."

R. L. Richie, veteran newspaper man and mining editor in Nevada, died Dec. 25, in Reno, Nev. He had celebrated his 80th birthday last May. For the past 15 years he had edited the mining page of the *Nevada State Journal* and the mining page of the *Reno Evening Gazette* for the last six years. In March, 1949, he sold the *Nevada Mining Press*, which he had published for a number of years. Mr. Richie had been the Nevada correspondent for *Engineering & Mining Journal* for the past 42 years. He received his early education in Chicago, where he was born, and later studied



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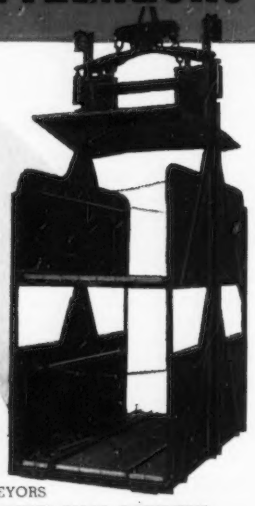

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in Scotland, England and Switzerland, when his family moved to Europe. He also studied at the University of Bonn. After his return to the United States, he went to Goldfield, attracted by the gold strike, and it was there he began his career as a writer of mining news. In 1940 he published a directory of Nevada mines, the only one of its kind in the country.

John Norman Houser

John Norman "Pope" Houser, vice president and general manager of Tennessee Copper Co., Copperhill, Tenn., and a director of Tennessee Copper Co. and Tennessee Corp., died at Knoxville, Tenn., on Nov. 6, 1949.

Mr. Houser was born on Aug. 12, 1882, at Summit Hill, Pa. He entered the mining business at the early age of 17 when he became associated with a New York financial group which managed mining enterprises. Sagely observing that progress, with commensurate rewards, was more likely to be achieved by workers at the mines, he left New York two years later to obtain first-hand operating experience and knowledge in mining and milling. Going first to Colorado and from there to Mexico, he rose rapidly from foreman to general manager. While at Cananea, the first electrostatic separating plant in Mexico was constructed under his direction. His successful activities at Cananea attracted attention and in 1912 he was put in charge of properties of the American Zinc Co. at Carterville, Mo. Mr. Houser remained at Carterville until 1914 when he went to Mascot, Tenn., as manager of the American Zinc Company of Tennessee. During this period of changing milling methods probably the first used in this country of copper sulfate as a flotation reagent was made under his management. Soon thereafter he became vice president in charge of mines of the American Zinc, Lead & Smelting Co.

In July, 1919, Mr. Houser became general manager of Tennessee Copper Co. at a time when the company's personnel was somewhat demoralized as the result of World War I. Blister copper and low-strength sulphuric acid were the only products at that

time. A carefully planned program of research and operational studies was inaugurated resulting in increased ore reserves and in the recovery of additional products from the ore, i.e. iron in the form of iron sinter and zinc as a zinc concentrate. Today the technical developments in mining, ore beneficiation, smelting and acid manufacture, as practiced by Tennessee Copper Co., are well known in the industry.

Mr. Houser was sincerely and deeply interested in human relations in industry. Despite his noteworthy technical accomplishments in mining and metallurgy, he probably will be best remembered for his creative organization work at Copperhill. His inherent honesty and frankness merited and won for him a high degree of enthusiastic service and loyalty from his associates, to whom he never failed to give full credit for work well done. He was intuitively a great leader of men.

Mr. Houser married Miss Frances Theresa Piollett in 1909. They had known each other from childhood. Besides Mrs. Houser he is survived by a daughter, Mrs. Gene H. Humphreys, and two granddaughters.

E. H. WESTLAKE

Arthur M. Hartford, 62, Alaska mining engineer, died Dec. 21, at Seattle, Wash. He was associated with the U. S. Smelting, Refining & Mining Co. in Alaska for 27 years, and for the past 12 years as manager of the company's Nome operations.

David E. Landsburg, 93, formerly underground superintendent in charge of the gold mine of Alaska Treadwell Mining Co., died Dec. 28.

Dr. Charles R. Mowery, 72, prominent physician and a long-time director of Coeur d'Alene Mines, Inc., in Idaho, died Dec. 29. in Spokane, Wash.

Claude E. Himebaugh, 57, died recently at Tucson, Ariz. He had been employed at Hayden for the American Smelting & Refining Co. since 1911 where he served for many years as safety engineer, and as head of the purchasing department.

Walter A. Janssen, who had been associated with the Department of Commerce in various capacities connected with metals and minerals since 1938, died recently in Washington, D. C. He was formerly a consultant on mining, chemical and metallurgical engineering in Pittsburgh, Pa., and from 1930 to 1933, served as general manager for International Vanadium Corp.'s mining and smelting operations and sales of vanadium and uranium products in Moab, Utah. He was made deputy administrator of the NRA in the Department of Commerce in 1933, and in 1938 became a consulting engineer in industry on economic technical management and marketing research in connection with mining, metallurgical and chemical engineering.

Temperature Control

8% to 12% GREATER FUEL SAVING

Prevents Sludging

Fewer Breakdowns

The HIGHER THE TEMPERATURE the LESS WEAR on the Cylinder Wall!

This startling fact is true! High heat (when uniform) is also beneficial to an engine otherwise, adding power, economy, longer life, and preventing sludge!

KYSOR SHUTTERS (now standard equipment on the LIMA!) maintain proper temperature automatically, affording positive protection within 8-10 degrees.

Install a Kysor shutter, now available to general contractors, on your new or old engine, or specify it from the manufacturer. *It will soon pay for itself in recognizable greater efficiency and full saving.*

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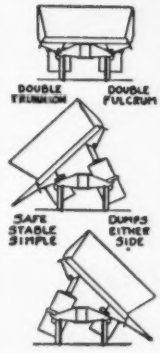

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Cut down costly job delay, and get the most out of your modern drilling equipment by specifying Crucible Hollow Drill Steel. The faster, harder blows of modern rock drills put drill steel to the test. And Crucible Hollow Drill Steel is made and *tested* to take it.

Controlled hardenability, excellence of stress-bearing surface and uniform processing all contribute to *on the job dependability* when you use Crucible Hollow Drill. To back up this fact, every lot of Crucible Hollow Drill is given an accelerated fatigue test which is correlated with *actual granite drilling.*

That's why so many hollow drill steel users are asking for Crucible, they know that for rock drilling Crucible has been proven by performance under service conditions . . . and that lot after lot is produced to chemical and structural uniformity. Check our local representative, he can help you apply Crucible Hollow Drill Steel to your requirements.

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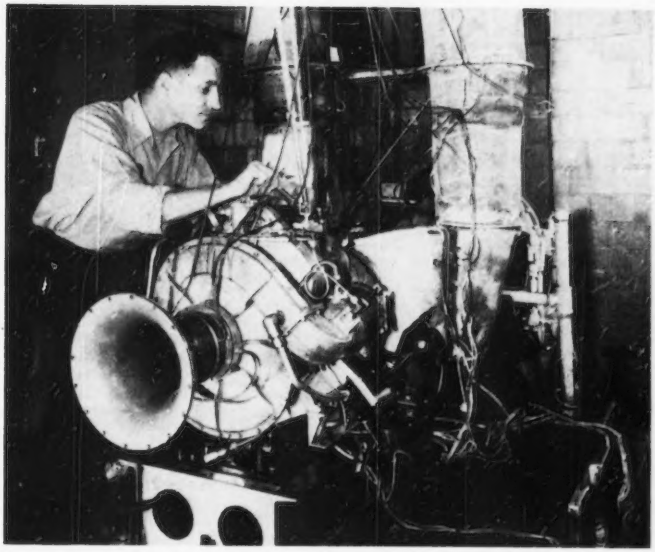
PREVIEW



(1)

GAS TURBINE being developed by Boeing Airplane Co., is . . . .

77% Smaller, 90% Lighter Than Diesel Engine

Nearing the marketing stage at Boeing Airplane Co.'s Seattle plant, is a lightweight 160-hp. gas turbine which may prove invaluable in inaccessible mining areas. The 185-lb. Model "502" has a 9.4-cu.ft. volume of installation envelope, compared with 40.5-cu.ft. for a 2,850-lb. diesel delivering the same horsepower.

The turbine has two major sections. The first is a gas producer, consisting principally of a single-stage centrifugal compressor, two can-type burners and an axial flow turbine wheel. The power-output section transforms the jet's thrust into shaft power without a mechanical connection.

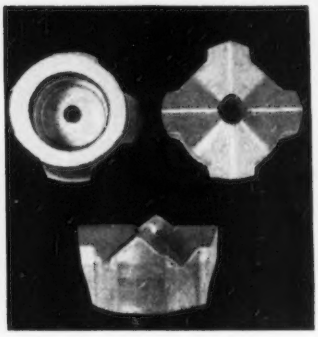
Gases travel from the first-stage turbine wheel, turning at 36,000 rpm., through a nozzle box and are expanded through the second-stage wheel driving the output shaft. This wheel is vaned, turns at 22,500 rpm. and drives through a 9:1 reduction gear, the speed to 2,500 rpm.

Starter power requirements remain nearly constant, even in sub-zero weather. The "502" will be cooled by normal circulation of air for nearly all applications.

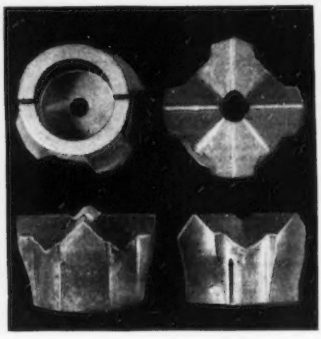
Fuel consumption is higher than that of comparable piston engines, particularly at idling speed. Boeing engineers admit this is a problem. Diesel fuel, kerosene and low or high-octane gasoline obtain about the same results. Boeing engineers expect to perfect the turbine's operation on low-grade industrial fuel oils, down to and including "bunker C."

The company revealed the experimental existence of this engine in 1947. As 1949 ended, it announced plans to manufacture enough turbines in the next two years to permit thorough service testing in a variety of industrial applications.

Edward C. Wells, vice president of engineering for Boeing, anticipates that one day the gas turbine will replace the piston engine in most applications from 50 to 500 hp. He predicts that the turbine "may fairly soon be in a position to replace the conventional diesel power plant in the field of truck transportation."



TYPE A features a close fit between bit and the drill steel.



TYPE B uses a slit to get a lock washer effect after heat treating.

TYPE C is given a 6-deg. twist leaving sides in spiral form.

One company made these three bits . . . Which would you choose? . . .
The manufacturer tells which he chose and why in this article on . . .

Developing a One-Use Bit(2)

AS ONE-USE BITS, featuring fast drilling at low cost came to the fore, Timken Roller Bearing Co., Canton, Ohio, developed and tested a number of different types. According to J. B. Baker, chief products engineer, all were workable, but the three best (shown above) were kept for field tests where they gave satisfactory performance. Only one was to be marketed, however, and here is the inside story of how the selection was made.

TYPE A has a circular collar section and hole. The hole is straight sided, 1 in. in diameter for 1-in. round steel or it can be made of different sizes and shapes to fit other standard drill steels. At the bottom of the socket there is a raised "V"-shape ring about .020 in. high, machined to size and of uniform diameter. The steels are dressed to fit these sockets closely. Ends are squared and then hardened to 25-30 Rockwell C scale. In use, the bits are attached to the steels by slipping them over the end of the steel and depending on the action of the drill to seat them. The sharp ring entering the end of the steel expands it into the socket of the bit holding the assembly together by pressure and friction. There are no recesses nor undercuts in the bit to collect dirt or scale. A sharp blow or two from a soft hammer or a smiliar tool dislodges the dull bit and the steel can be used over and over again, because the diameter of the rings in the bits is uniform and interchangeable. When a steel wears out or breaks, it can be reconditioned quickly and economically. Patents on this bit have been applied for.

This bit was not offered for sale, because of the close fit required between the steel and the bit socket.

TYPE B also has a circular collar section and hole. Again the hole is straight sided, 1 in. in diameter for 1-in. round steel or it can be made in other sizes and shapes to match standard drill steels. The collar of the bit is split before hardening in one or more places, the split extending down the collar but not to full hole depth. It terminates in either a drill hole or a full radius.

Location of the splits is extremely important because of the action desired from heat treating. The collar section of the bit is given a spring temper and hardening action is such that one side of the split contracts more than the other, producing the same effect as in a lock washer. Drill steel does not have to be sized on the outside diameter but is merely end squared and heat treated to 25-30 Rockwell C scale. The bit is assembled by hand to the end of the steel and is then fully seated by the action of the drilling machine. Collar sides are expanded slightly. Leading edges of the slits bite into the side of the steel so that the required rotating torque can be transmitted positively. There are no undercuts or recesses in the bit cavity to be machined or to collect scale and dirt. One or two sharp hammer blows will dislodge the bit from the drill steel after it has become dull and the steel may be used over again. When the bottom portion of the drill steel wears out, it can be reconditioned, followed by the necessary heat treatment. Patents on this particular type of construction are now pending.

This bit was not selected as the one to promote because the surface nicking of the steel end might lessen steel life and because of the cost of slitting the bit collar.

TYPE C has a square collar section and hole. The hole is straight sided, ⅞ in. for ⅞-in. quarter octagon steel and it can also be made to fit other standard drill steel shapes and sizes with the exception of rounds. For the latter, the steel is usually body squared and the square socket bit is used. This is no basic handicap because it is not necessary to use round steels at all. Hexagon or quarter octagon can be substituted, this being a matter of user preference influenced perhaps by the amount of steel inventory.

The socket of the bit is approximately the same depth as it is across the flat, the cross section of the opening being rectangular. The bit forging is flashed at the back face. The collar back face has a radiused effect which tapers into the steel. The feature eliminates a flat collar back face protruding past the drill steel and permits easy retraction. After the socket is formed, it is given a 6-deg. twist to the left leaving the sides in a spiral form. The collar section is then heat treated to a spring temper. The rest of the bit is hardened in the usual manner.

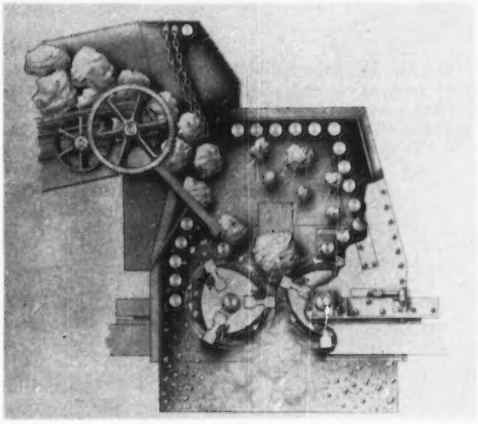
Without regard to the size or shape of drill steel used, the end may be body squared by forging or machining, then end squared and heat treated to 35-40 Rockwell C scale. In assembly, the bit is started on the steel by hand and is then seated by the action of the drilling hammer. The steel which is straight at the end takes out some of the twist of the socket which

hugs it tightly. Rotational torque is easily transmitted, assembly is maintained during drilling and the dull bit can be removed easily by a sharp blow or two. There are no recesses in the socket of the bit to collect dirt and scale and to hamper forging.

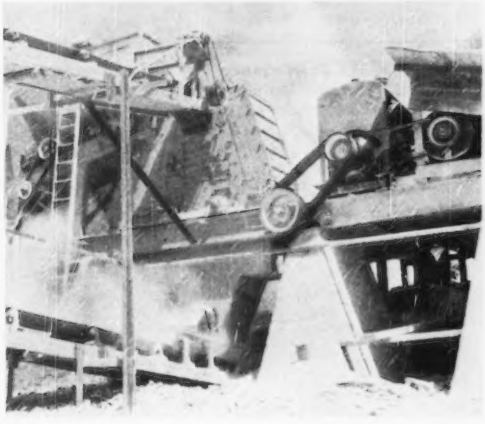
Ordinarily no damage is done to the steel end during the operation and the same steel can be used over and over again. If the steel end is damaged, it can be cut off, end squared, and re-heat treated as it is made long enough for this purpse. If the steel breaks further up the body, it must be body squared end squared and re-heat treated. The large clearance between the steel and the bit socket walls due to required tolerances permits the maximum ease of manufacture of the bit and use of mill rolling tolerances of the steel. Patent applications have been filed for this construction also.

This bit is our selection for the trade as it seems to be the best, the most nearly fool proof and the lowest in cost. The bit can be furnished in the "cross" type or in the "X" type with or without pilots, in gages from 1 9/16 to 2⅛ by 1/16 in. and with square or hexagon sockets.

Tests prove this bit is a fast drilling, inexpensive one-use tool which will help to lower mining costs in those localities for which it is best suited. It is not intended to replace the regular Timken rock bit with threaded collar or compete with Timken carbide insert rock bit. It is intended to fill out the line and to do the job for which it has been designed.



BREAKING BEGINS when rock hits high speed impellers (1,000 rpm.), continues as fragments collide in chamber.



SEMI-PORTABLE UNIT includes breaker, feeder, diesel power plant generator and electric motor, all skid-mounted.

Double Impeller Breakers Use Dual Impact Action(3)

A FOURTH AND INTERMEDIATE size double impeller breaker was recently added to the line produced by **New Holland Mfg. Co.**, Mountville, Pa. Model 4040 handles 150 to 250 tons per hour of any material that will pass a 40-in. sq. opening. It breaks material to 2½ in. minus, using 150 to 200 hp. (electric) or 220 (diesel).

In operation, it follows the same principles as prior models. Here's how dual impact action works in the New Holland crusher.

1. You feed run-of-mine into the breaker with almost any type of feeder desired, apron, reciprocating plate or vibrating.

2. Rock entering the breaking chamber falls directly onto the whirling impellers. Rotating upward and outward at speeds up to 1,000 rpm., these twin impellers smash the rock in midair. Up to 6,000 smashing blows a minute crash against the rock in the breaking chamber.

3. Pieces are hurled against the steel breaker bars, scientifically placed around the breaking chamber. Rock glances off these rounded bars immediately. Can't jam or pack under normal operations.

4. As pieces of rock hurdle through the breaking chamber, they collide with other pieces, causing further reduction. Once stone leaves the impeller, it thus continues to be broken without using extra power.

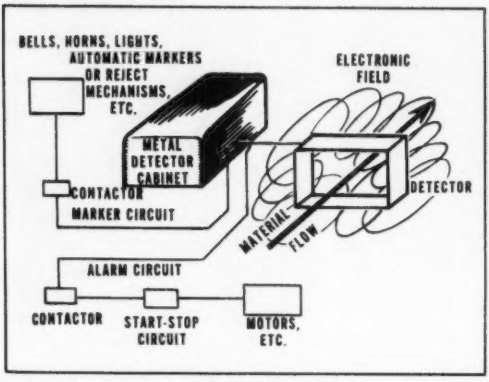
5. Three methods are used to produce required sizes. Speed of impellers establishes the range of sizes to be produced. Raising or lowering the vertically adjustable breaker bar determines which sizes in that range will be produced in greatest quantity. Horizontally adjustable bars can be used to guard against excessive oversize.

6. Finished product flows freely out of discharge openings. Conveyors or bucket elevators can be used for stockpiling or discharging into bins in an open or closed circuit operation.

General Specifications of Double Impeller Breakers

Model	Feed Opening In.	Capacities* Tons per Hour	Minimum Size* Product—In.	Horsepower* Electric	Horsepower* Diesel
1212 ...	12 x 12	20- 35	—1¼	30- 40	50- 60
2020 ...	20 x 20	50- 75	—1½	50-100	75-125
3030 ...	30 x 30	75-150	—1½	60-120	110-165
4040 ...	40 x 40	150-250	—2½	150-200	110(2)
5050 ...	50 x 50	350-400	—4	300	165(2)

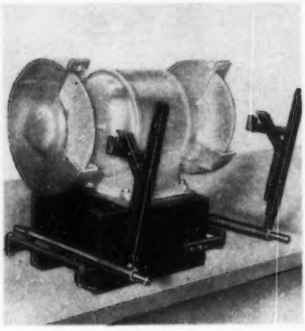
*Depends on characteristics of material being crushed.



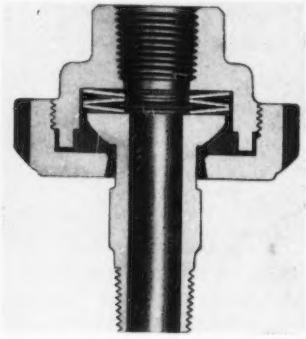
METAL DETECTOR reveals ferrous and non-ferrous tramp metal. Automatically stops conveyor. Effective at belt speeds up to 900 fpm. Sensitivity adjustable, requires no balancing. Available: Eriez Mfg. Co., Erie, Pa. (4)

SHOVEL TEETH of Fibraloy lock rigidly to adapters. Heavy tongues at top and bottom of point shoe fit slots in adapter horn. Tapered pin securely locks assembly. Available: Baer Steel Products, Inc., Auburn, Wash. (5)

SINKER in the 55-lb. class is for holes up to 25 ft. The CP-59 features quick change to dry, blower dry, wet or air-water operation. Chicago Pneumatic Tool Co., New York. (6)



JIG for dressing Kennametal carbide-tipped rock bits can be mounted on any standard double-end grinding machine. Available: Kennametal Inc., Latrobe, Pa. (7)



SWIVEL JOINT will handle almost all fluids, rotating continuously up to 30 rpm. Available in straight or 90-deg. angle designs, ¾ to 1-in. pipe sizes: Barco Mfg. Co., Chicago (8)

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Mail this form to Engineering and Mining Journal, 330 W. 42nd Street, New York 18, N. Y.

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4	11	18	34	41	48	74	81	88
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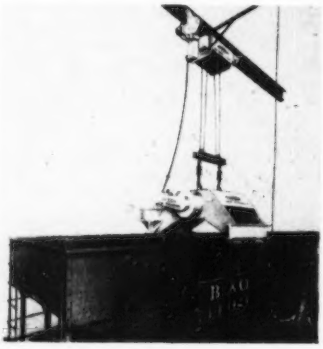
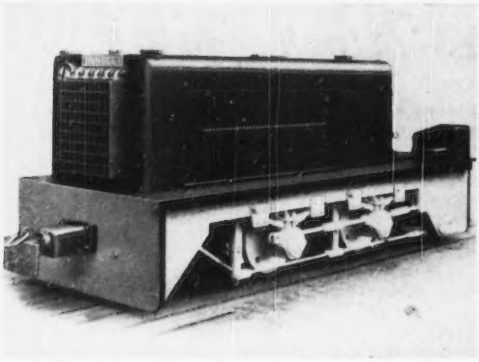
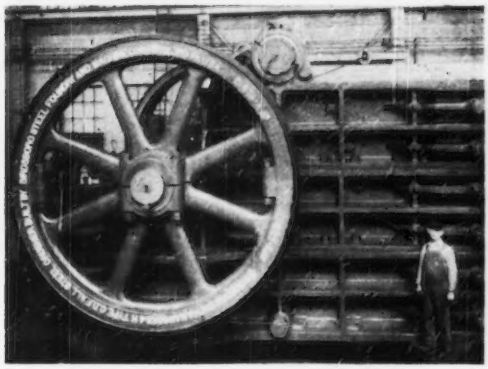


CAR SHAKER reduces time for emptying cars to a few minutes. Lo-Hed shaker comes with twin or single hook hoist. Available: American Engineering Co., Phila., Pa. (9)



DIESEL LOCOMOTIVE is designed for narrow gage railways where rail weight is 20 to 22 lb. Four-cylinder engine develops 72 bhp. at 1,800 rpm. Top speed is 15½ mph. Hunslet Engine Co., Ltd., Leeds, England. (10)



JAW CRUSHER is largest deep frame type ever built. The 289-ton unit is powered by a 300-hp. motor. Handles 400 tons per hour at minimum 8-in. setting; Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. (11)

Equipment Shorts

SPEED CONTROL. (33) A new hydraulic control has been developed for use on the Reeves Vari-Speed Motodrive to provide a sensitive and accurate means of obtaining automatic speed changing. Pressure of only a few ounces will produce changes in output speeds. Available: **Reeves Pulley Co.**, Columbus, Ind.

DOZER BLADE. (34) A bulldozer blade attached to the Model D Roadster Tournapull has been announced. The blade is suspended in front of the Tournapull, cable-activated and is electrically controlled by a switch mounted on the dash panel. Blade is 6 ft. 8¾ in. long and bowl is 32½ in. It can be raised 3 ft. above the ground. Available: **R. G. LeTourneau, Inc.**, Peoria, Ill.

LIFT TRUCK. (35) On the market in February will be a 2,000-lb. capacity lift truck. Redesign of a former model, Model 20 is powered by a Wisconsin air-cooled engine and features numerous improvements. Available: **Hyster Co.**, Portland, Ore.

SPEED REDUCER. (36) Torque-Arm speed reducer is a "package" which mounts directly on the driven shaft. Unit has a fixed ratio of 15:1, driven through any V-belt or flat belt drive. Output speed can be varied from 13 to 133 rpm. by use of stock sheaves. Available: **Dodge Mfg. Corp.**, Mishawaka, Ind.

BATTERY. (37) Silvercel battery is only 1/3 to 1/5 the weight of common batteries now in use. Volume is ½ to 1/3. Manufacturer claims an energy efficiency of 85% which is almost 20% higher than lead and nickel batteries. There are no plates or separators to be damaged. Five types now made vary from 0.5 to 40 ampere-hour capacity. Available: **Yardney Electric Corp.**, New York, N. Y.

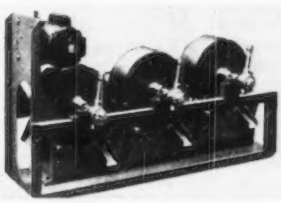
GROUND CLAMP. (38) Copper band serves as clamp for conduits, metal surface wiring raceways, signaling devices, appliances, etc., and doubles as a ground. Comes in two sizes, one to fit ⅜ to 1¼-in. pipe and the other to fit ⅜ to 3-in. pipe. Available: **Blackburn Specialty Co.**, Cleveland, Ohio.

POCKET BALANCE. (39) Analytical balance is extremely sensitive. Has a capacity up to 20 g. and can weigh up to 200 mg. without small weights. Adjustments are made in the same way as on large models. Sensitivity is 2 mg. Available: **Voland & Sons., Inc.**, New Rochelle, New York.

RESPIRATOR. (40) Seven interchangeable filters offer protection to the worker from seven respiratory hazards. Twin cartridges are used and a flexible fitting brace shapes respirator to individual features. Available: **American Optical Co.**, Southbridge, Mass.

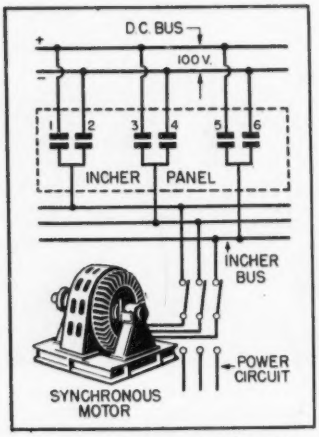
SLUDGE REMOVER. "Houghto-Solv" is a fuel oil additive that removes sludge from heating systems. One quart per 1,000 gal. of oil is recommended for practice. Sludge can be removed from burner tips by soaking overnight. Available: **E. F. Houghton & Co.**, 303 W. Lehigh Ave., Philadelphia 33, Pa.

HYDRAULIC COUPLER can be used where either standard or breakaway type is required. Works under all operating pressures. Available: Ulrich Mfg. Co., Roanoke, Ill. (32)



MAGNETIC SEPARATOR features counter flow separation. Any number of compartments can be used in this laboratory unit. Available: Jeffrey Mfg. Co., Columbus, Ohio. (31)

UNIVERSAL CHUCK locks faster than conventional models. Threaded mounting eliminates adapter plate. Jaws are reversible. Westcott Chuck Co., Oneida, New York. (41)

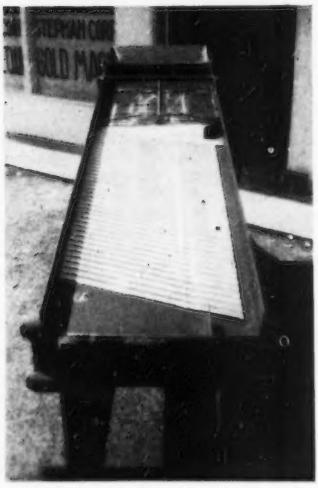


How to Spot a Ball Mill

Ball mills can be spotted quickly, precisely and safely with Incher Control. The system is advantageous in positioning mills for loading and discharge of balls, and for inspection and replacements of linings.

Six contactors in the Incher Control panel, operated by a single timing cam, convert direct current into very low frequency 3-phase alternating current. When the motor is connected to the inching bus, and the Incher Control button is pressed down, this low frequency current rotates the motor very slowly. One control can serve several motors.

Available: Electric Machinery Mfg. Co., Minneapolis, Minn. (12)



CONCENTRATING TABLE has all-metal construction and uses grooves instead of riffles. Is adjustable for different types of ores. Stephan Corp., Sacramento, Calif. (13)

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their number on form (P. 142) and mail.

DIESEL ENGINES. (71) Complete specifications for automotive and industrial models of two supercharged, six-cylinder diesels, 275 and 300 hp., are contained in bulletin Nos. 5285 and 5290, recently announced by **Cummins Engine Co.,** Inc., Columbus, Ohio.

RUBBER-LINED FITTINGS. (72) An eight-page catalog section on rubber-lined pipe, fittings and valves has been issued by **B. F. Goodrich Co.,** Akron, Ohio.

CYANAMID PRODUCTS. (73) A 64-page revised edition of "Products and Services of American Cyanamid Co. for Industry and Agriculture" has been published by **American Cyanamid Co.,** New York, N. Y.

SPIRAL CONCENTRATOR. (74) Bulletin 10, "Humphreys Spiral Concentrator Closed Circuit Test Unit, Manual of Operating Instructions" is now available from **Humphreys Investment Co.,** Denver, Col. The spiral concentrator, why it works, applications, procedure for test work and operating instructions are given in 25 pages.

LEVEL CONTROL. (75) Instruments for indicating, measuring and controling liquid level and inter-face level are described in catalog put out by **Fischer & Porter Co.,** Hatboro, Pa.

TRANSFORMERS. (76) A 12-page booklet, B-4319, recently released by **Westinghouse Electric Corp.,** Pittsburgh, Pa., describes construction features of complete Westinghouse line of instrument transformers.

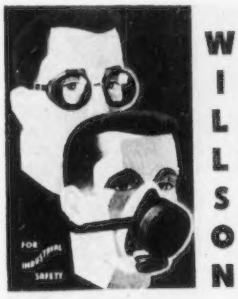
DIESEL ENGINES. (77) Superior diesel engines for stationary installations are described and illustrated in a 20-page bulletin offered by Superior Engine Div., (Springfield, Ohio) **National Supply Co.**

ELECTRICAL DEVELOPMENTS. (78) Annual review of electrical and allied developments made by **General Electric,** Schenectady, N. Y., is now available.

STEEL. (79) A 32-page brochure, "The Transportation Steel," describing Otiscloy, low alloy, high-strength steel, has been announced by **Jones & Laughlin** Steel Corp., Pittsburgh, Pa.

SHOVELS. (80) Aluminum alloy shovels and scoops that are light, acid resistant, non-corrosive, nonsparking, are described in a bulletin published by **Wood Shovel and Tool Co.,** Piqua, Ohio.

LUBRICATION. (81) Bulletin No. 31 describes the combination oil cup and oil gauge manufactured by **Trico Fuse Mfg. Co.,** Milwaukee, Wis.



SAFETY EQUIPMENT Willson Products, Inc., catalog includes technical and reference material. (88)

PUMPS. (82) Descriptive data, construction details and operating information on two pumps manufactured by the **Labour Co.,** Inc., Elkhart, Ind., is given in their bulletin 53.

FILTERS. (83) Two bulletins are available describing the continuous filter and horizontal rotary filter made by **Oliver United Filters, Inc.,** New York, N. Y.

RADIAL ENGINE. (84) Bulletin 172 describes and illustrates two-cycle, 11-cylinder, 14x16-in. radial engine which develops 1,800 hp. at 400 rpm. This is a product of **Nordberg Mfg. Co.,** Milwaukee, Wis.

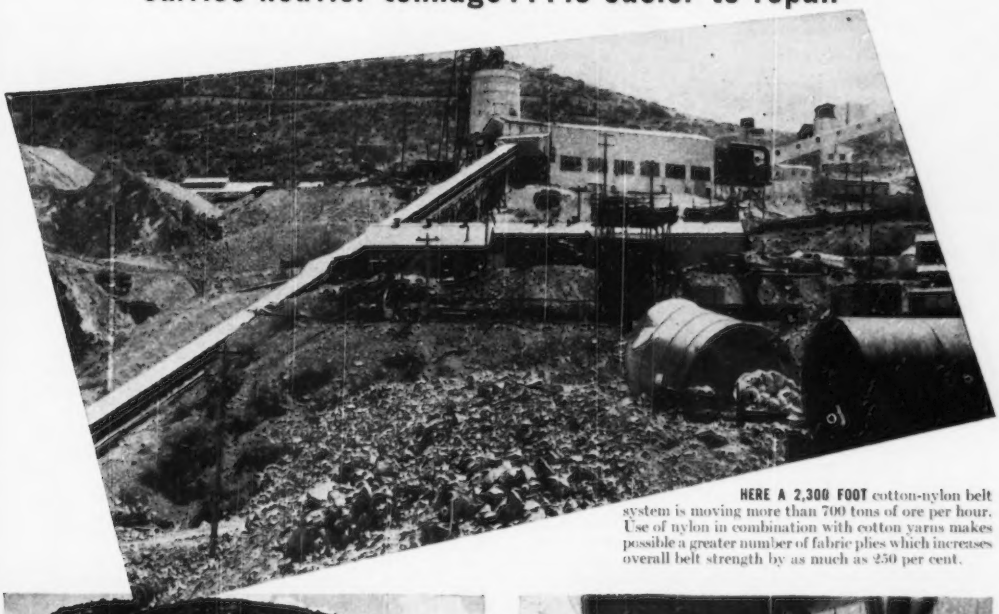
PUMPS. (85) Bulletin W-350-B-11 describes pump equipment used in handling chemicals, with explanation of Worthington mechanical seal to prevent leakage of corrosive materials, description of Worthite, corrosion resistant metal. Recently published by **Worthington Pump and Machinery Corp.,** Harrison, N. J., this bulletin may be had by circling No. 85 and mailing form, page 142.

BEARINGS. (86) New catalog, "Bronze and Copper Bearings and Castings" gives physical properties and comparative specifications for 27 different bronze alloys and 5 aluminum and manganese bronzes. The 28-page booklet also describes Babbitt metals. Published by **American Brake Shoe Co.,** New York, N. Y.

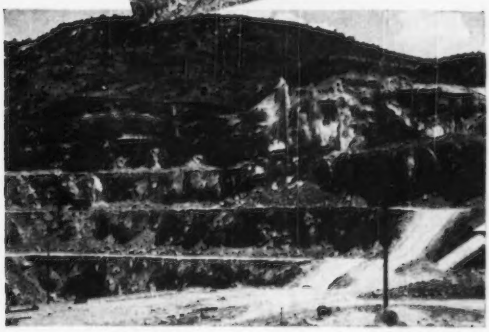
LOCOMOTIVE CRANE. (87) A four-page brochure highlights a new 25-ton DiesElectric Locomotive crane (Model 825 DE) recently announced by **American Hoist and Derrick Co.,** St. Paul, Minn.

NYLON MAKES NEW BELT UP TO 250% STRONGER

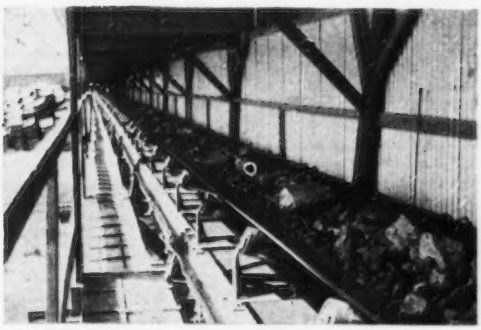
Also provides more flexibility... easier training... carries heavier tonnage... is easier to repair



HERE A 2,300 FOOT cotton-nylon belt system is moving more than 700 tons of ore per hour. Use of nylon in combination with cotton yarns makes possible a greater number of fabric plies which increases overall belt strength by as much as 250 per cent.



THE SERVICE REQUIRED of conveyor beltings in this mining region demands a thick belt with great elasticity and high abrasion resistance. Despite its thickness this "U. S." Belt has greater flexibility, to conform more easily to path and contour of idler pulleys. This increases tonnage, reduces spillage.



KNOWN AS STYLE YN, this belt has been specially designed to accelerate the ever-expanding scope of mechanization, making possible longer centers and higher lifts resulting in ever-increasing economies. In speed and facility of repairs this belt is unequaled in its class.

If you have any problem involving conveyor belting, talk it over with our engineers. They will gladly work with your own men in advising, planning or executing any job. Write Mechanical Goods Division, U. S. Rubber Company, Rockefeller Center, New York 20, N. Y.

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NEW PLANT at Utica, N. Y., cost Chicago Pneumatic Tool Co. about $5,000,000. The 12-acre layout includes overhead conveyors, modern lighting, 500-seat cafeteria and other features to promote safe, convenient operation.

Memos from the Manufacturers

George W. McGrath has been elected director of **Easton Car & Construction Co.**

Robert W. Persons is now product sales manager of the Drill Steel Div. of **Crucible Steel Company of America.**

Paul F. Preston has been named engineering manager of the Chemicals Div. of **General Electric's** Chemical Dept. He succeeds **C. Stewart Ferguson** who has been appointed west coast manager of that division.

American Wheelabrator and Equipment Corp. has appointed **J. Robert Bunch** sales representative in the Cleveland office.

Bernard M. Costello has been named vice-president-manufacturing, and **William E. Ireland**, vice-president-sales, **International B. F. Goodrich Co.**

Seven new men have been added to the field staff of **Minneapolis-Honeywell Regulator Co.** to handle sales of industrial controls, valves and Brown instruments. The men are: **Bruno Krause**, Pittsburgh; **R. A. Schwarz**, Minneapolis; **T. Sabottke**, Hartford, Conn.; **W. P. Ryan**, East Orange, N. J.; **D. Fritch**, New York; **C. Swanson**, Detroit; **L. M. Crowe**, Cleveland.

The Dorr Co. has moved its general offices to Stamford, Conn.

Albert I. Edwards has been named basic industries machinery specialist for **Allis-Chalmers** Mid-Atlantic region. **William D. Busch** has been transferred to Youngstown, Ohio, as sales representative.

Fairbanks, Morse & Co. has made **R. L. Van Alstyne** manager of all scale factories.

T. T. Pattison has been appointed district manager in charge of all sales and field operations of **National Mine Service Co.** in Illinois, Indiana and Western Kentucky.

K. W. Horsman is now works manager of Dunellen, New Jersey Works of **Worthington Pump and Machinery Corp.**

United States Rubber Co. has purchased the Chemicals Div. of **Glenn L. Martin Co.**

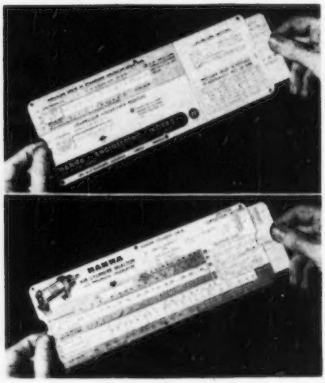
Myron R. Coughenour joins **Connellsville Manufacturing and Mine Supply Co.** as engineering manager.

Colorado Iron Works Co. has named **T. J. Jensen** sales manager.

New branch manager of the Chicago office of Morse Chain Co., Div. of **Borg-Warner Corp.**, is **Robert G. Holmes.**

Joy Manufacturing Co. has announced the appointment of **Paul M. Barlow** as manager, mining sales.

MARKING TOOL uses tantalum-carbide point to mark steel tools for easy identification. Vibro-Tool writes like pencil, costs $7.50. Available: Burgess Battery Co., Lake Zurich, Illinois. (14)



SLIDE CHART quickly gives all data required for air cylinder calculations. Includes instructions and conversion of factors. Available FREE: Hanna Engineering Works, Chicago, Illinois. (15)

BEETLE BACK protects miner returning to raise after blasting. Aluminum shield is light, easy to carry with belt and shoulder straps. For further information on this interesting safety device, use form p. 142. (16)

SEND FOR THIS 32 PAGE MULTICLONE BOOKLET

HELPFUL-INFORMATIVE IT OUTLINES THEORIES AND BASIC PRINCIPLES OF CENTRIFUGAL DUST RECOVERY!

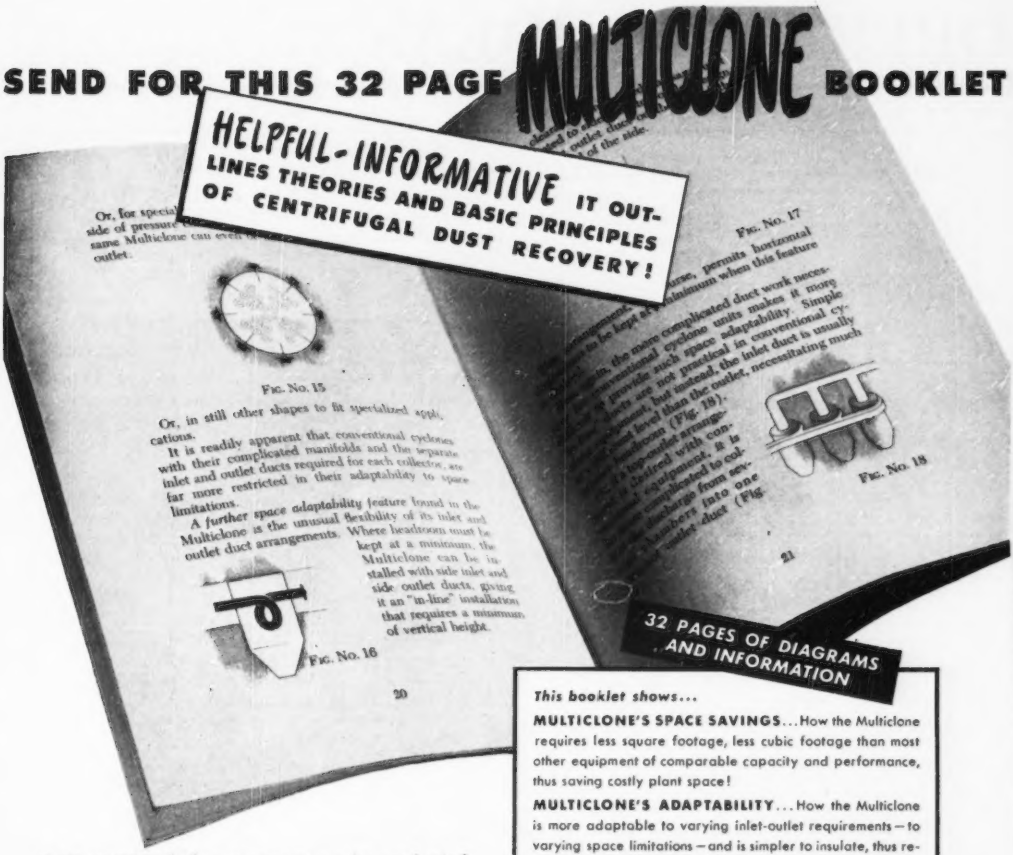


FIG. No. 15
Or, in still other shapes to fit specialized applications.
It is readily apparent that conventional cyclones with their complicated manifolds and the separate inlet and outlet ducts required for each collector, are far more restricted in their adaptability to space limitations.
A further space adaptability feature found in the Multiclone is the unusual flexibility of its inlet and outlet duct arrangements. Where headroom must be kept at a minimum, the Multiclone can be installed with side inlet and side outlet ducts, giving it an "in-line" installation that requires a minimum of vertical height.
FIG. No. 16
20
FIG. No. 17
FIG. No. 18
21
32 PAGES OF DIAGRAMS AND INFORMATION

NO MATTER whether you are now using mechanical dust recovery equipment or are planning the installation of such equipment at some future date, here is a booklet that is full of helpful and valuable information on centrifugal dust recovery. It not only explains the basic methods and principles involved, but also shows the important differences between small and large diameter separating tubes, shows how to simplify your duct work and reduce installation costs, and outlines many other important factors to be considered in selecting mechanical dust recovery equipment.

In addition, this informative booklet illustrates and explains how MULTICLONE'S unique *vane* design is fundamentally different...how it makes possible greater compactness, simpler installation, high recovery of the small particles as well as the medium and coarser ones, and many other facts on MULTICLONE advanced design.

A limited supply of these booklets is available for free distribution to those interested in mechanical recovery equipment and methods. Write for your copy today.

This booklet shows...

MULTICLONE'S SPACE SAVINGS...How the Multiclone requires less square footage, less cubic footage than most other equipment of comparable capacity and performance, thus saving costly plant space!

MULTICLONE'S ADAPTABILITY...How the Multiclone is more adaptable to varying inlet-outlet requirements—to varying space limitations—and is simpler to insulate, thus reducing installation costs!

MULTICLONE'S EFFICIENCY...How Multiclone's multiple *small diameter* tubes, made possible by its exclusive *vane* design, give higher centrifugal forces and more complete cleansing of *all* suspended particles—even small ones of 10 microns and less!

MULTICLONE'S LOW MAINTENANCE...How the Multiclone has no high speed moving parts to repair or replace, no pads or filters to clean or renew, nothing to choke gas flow or increase draft losses as suspended materials are recovered. Multiclone draft losses remain uniformly low—recovery efficiencies uniformly high—at all times!

Make sure that a copy of this helpful booklet is in your reference files by sending for your copy now!

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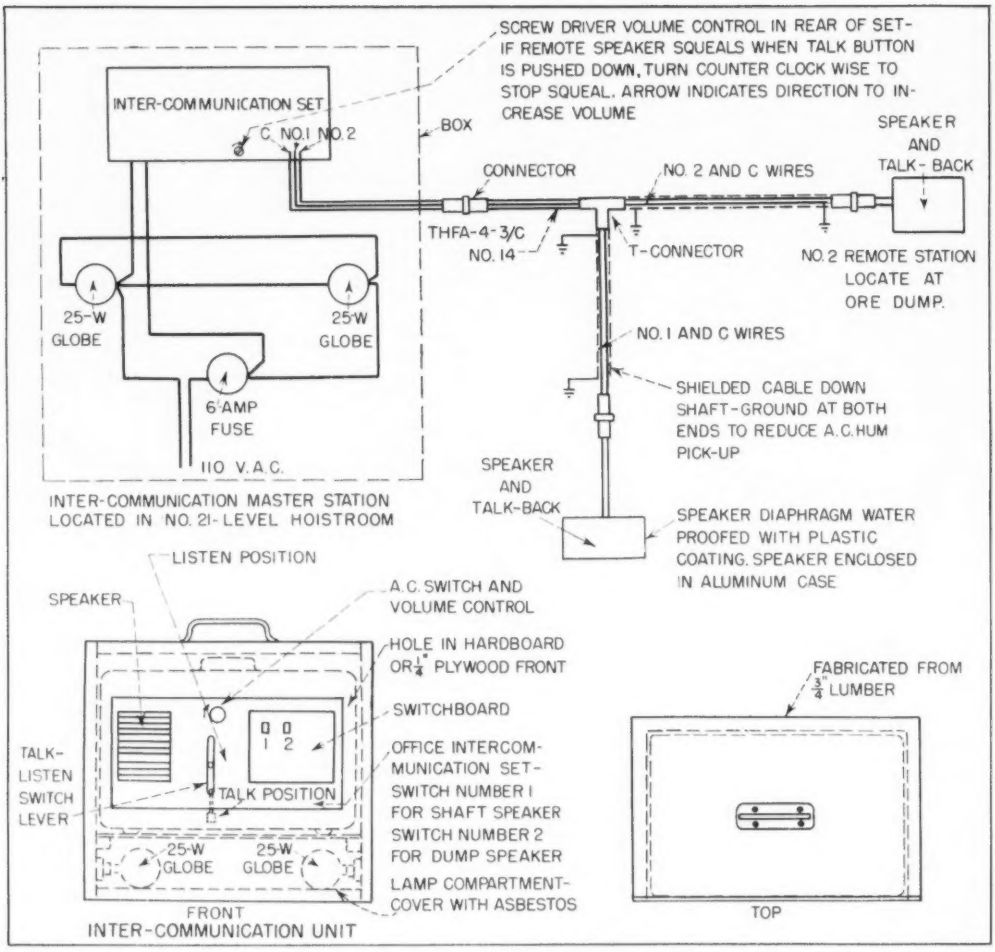
OPERATING IDEAS

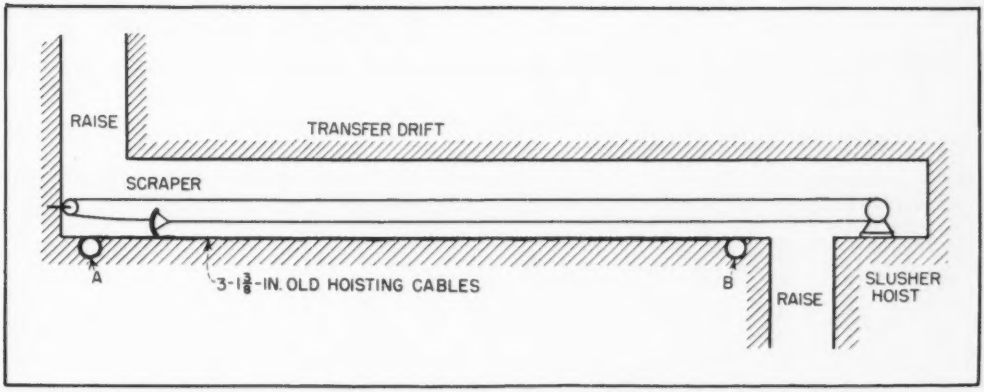


Inter-Com. Unit Makes Shaft Sinking Faster and Safer

The Bunker Hill & Sullivan Mining and Concentrating Co., Kellogg, Idaho, used the intercommunication system shown here during the sinking of the 1,100-ft., 50-deg. auxiliary shaft completed recently. With this unit, the hoistman could remain in constant contact with drillers, muckers, timberman in the bottom of the shaft, and with operators on the dump station. The device was particularly useful during loading operations with the special mechanical mucker developed by the Bunker Hill staff for incline shaft rounds. Net result was a much faster and safer shaft sinking cycle.

The inter-communication set and speaker and talk-back units in the bottom of the shaft and dump station are war-surplus goods. External wiring of the system is shown above. The shielded cable running down the shaft is grounded at both ends to reduce ac. hum pickup, and the set on the 21 level hoist-control platform is fitted with a screw driver control. If the remote speaker squeals when the talk button is pushed, the screw is turned as indicated until the squeal stops.

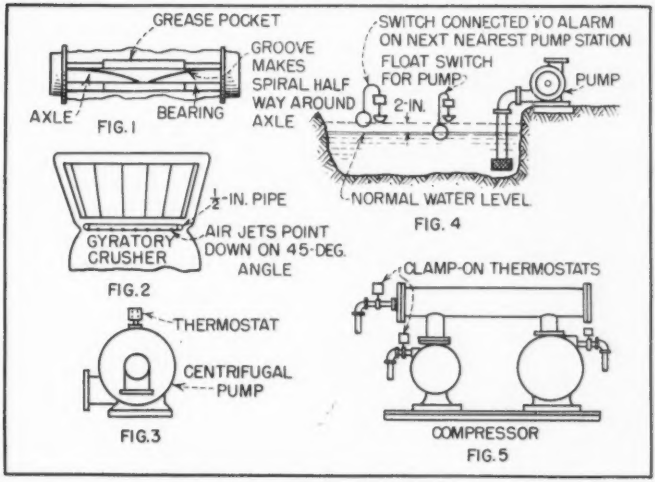
The set is housed in a wooden box made of $\frac{3}{4}$-in. planed lumber. Speaker diaphragm and remote speaker and talk-back sets are waterproofed with a coat of "Seal-Flex" plastic coating. Each set is inclosed in 14-gage aluminum. The set was designed by A. C. Stevenson, chief engineer, and members of his staff.



Old Hoisting Rope Forms Scraper Slide

Three old 1⅜-in. hoisting cables were fastened to the floor of a transfer drift at the Cambria Jackson mine, Negaunee, Mich., to provide a surface over which the scraper could slide without digging into the bottom. Ends of the cables were attached to logs A and B by wedging the ends into 1½-in. holes bored through the logs.

Installation of the new flooring can be completed by two men in a day, and provides an excellent way to use up old hoisting rope. Formerly, the installation of plank floors required the service of three men for four days, plus the cost of the flooring. Except for a slight buzzing sound, the scraper travels smoothly over the cables. Performance during a three-week test period was satisfactory. Superintendent W. Atkins, of the Cambria Jackson mine, developed the idea.



Preventive Maintenance at the Empire Star Mines, Ltd.

Phil Keast, ingenious master mechanic of Empire Star Mines Co., Ltd., Grass Valley, is already well known to many readers of these pages because of his excellent previous contributions. Here are a few more on preventive maintenance:

1. **Wheel axles** of hoisting skips have been fitted with grooves which "screw" grease out to bearings on the upward trip of the skip. See Fig. 1 shown at left.

2. **The gyratory crusher** in the mill is equipped with a ½-in. pipe containing a series of holes below concaves to prevent sticky ore from packing around the dust ring. Compressed air is supplied from nearby air line. Holes are drilled so that air jets point down on a 45-deg. angle. See Fig. 2.

3. **Most pumps** are fitted with thermostats which shut down any pump failing "to take its water." Heating of the pump case which results from such failures causes the thermostats to shut off the pump. This idea has saved many hundreds of dollars in repairs and shutdowns, especially on high-speed centrifugal pumps. See Fig. 3.

4. **Automatic** controlled pumps are equipped with a horn or buzzer to warn pump operators on another level of pump overloads or failure. As shown in Fig. 4, switches controlling the pump and warning signal go into action when the water level in the sump has risen 2 or 3 in. above normal.

5. **Thermostats** have been installed on cooling-water outlet pipes of compressors. The compressor is automatically shut down the moment water temperature rises above normal. See Fig. 5.

IRON ORE IN LABRADOR

BASE OF OPERATIONS for preliminary work on Labrador-Quebec iron ore is Burnt Creek (pop. 215), largest of 26 camps in the Ungava area. Camp is on a 12 million-ton ore deposit so later it will be moved to Knob Lake.

Work Goes Forward on the Mesabi of Tomorrow

CHURN DRILL brings up sample at Star Creek deposit. More than 25 deposits have been drilled to date.

BETWEEN BURNT CREEK, some 700 air miles northeast of Montreal, and Ungava Bay on the Hudson Strait, lies an iron ore deposit covering 24,000 virtually uninhabited square miles. To transport men and mining equipment into this new frontier area, a 360-mile air trail has been arched over the rocky wilderness.

How soon the 324-million-ton supply of proven ore can be tapped is still a matter of guess. About $200 million will be spent for mines and shipping facilities.

HELICOPTER, chartered by Topographical Survey of Canada, is only means of transport to many parts of area.

IN MINING

IN THE UNITED STATES

- Sleds Move Alaskan Dredge 26 Miles—P. 151
- Hanna Puts Out Fire Hundreds of Years Old—P. 157
- Uranium Find Announced in Michigan—P. 158

ALASKA

★**Fairbanks Exploration Co.** of Fairbanks has dismantled its No. 2 gold dredge on Goldstream Creek preparatory to moving it 26 mi. to Fairbanks Creek on property just below that belonging to the **Fairbanks Creek Gold Dredging Co.**

The pontoons and upper structure were cut into four sections, the heaviest of which weighs 154 tons, is 60 ft. long, 32 ft. wide and 55 ft. high. The 75-ton stacker and the 100-ton digging ladder were removed and are being moved separately, as are the four hull cases and the bow and stern gantries. Some steel and parts were trucked over but most of the moving will be done on steel bobsleds, built especially for the job in Seattle.

Cross-chain-hooked, these bobsleds have a gage of 10 ft. and runners 10 in. wide with a heating device on the shoes to prevent freezing down. Each sled is designed to carry 150 tons, total weight of the dredge being 2,100 tons. Cable is being used throughout, chain becoming brittle and subject to breakage during cold weather.

The sleds will be pulled by six to eight D-8 Caterpillars hooked in tandem. The route involves 1½ mi. of grade, the steepest of which is 19 percent and which may require the stringing of cable up the hill, through a pulley and back down to the Caterpillar draw-bars.

Two sleds will be used to move one section. As the dredge was cut, heavy timbers were laid beneath each section and extending out beyond. The sleds were backed beneath these and the sections skidded down over them and then let down on the bunks of the sleds.

This is the third dredge to be moved by the company in the Fairbanks area. The first was transferred from Fox to Ester in 1936, the second from Cleary Creek to Eldorado in 1947. These were smaller dredges, however, weighing 1,200 tons as compared to 2,100 tons for the No. 2 dredge now being moved.

Dredge No. 2 was built in 1928 on Goldstream just about opposite its present location. A pit has been prepared at the new location and, next summer, water in this pit will float the boat upon which the dredge is built.

Preparation of the trail from Goldstream to Fairbanks Creek required about a year and necessitated considerable earth moving. The swath is 100 ft. wide.

★According to a report of the U. S. Bureau of Mines, gold production dropped 5% in 1948. It was only 41% of the 1940 record production in the Nation. Alaska ranked fourth in amount of gold produced. Of the 2,014,257 oz. output in gold in 1948, Alaska mined 248,395 oz.

★Judge Anthony J. Dimond handed down a decision in the third district court, giving a syndicate of Medford, and Portland, Oregon, full rights to develop deposits of gold near Nome, in the Kougarak district.

★Operations of the **Chicago Mining Co.** were expected to start early in 1950 at its gold property in southeastern Alaska, to clean up a rock pile and tailings.

ARIZONA

★Arizona's mining production has been valued at $170,000,000 by the State Department of Mineral Resources. This estimate is down $30,000,000 from the 1948 figure.

Charles H. Dunning, department director, reported that in spite of the decline, Arizona's mining production is holding up well and attained an all-time high in lead and zinc.

Production figures as compared with 1948 are, with 1949 production listed first: gold, 110,022 oz., 109,487; silver, 4,983,066 oz., 4,837,740; lead, 66,844,000 lbs., 59,789,000; zinc, 135,836,000 lbs., 108,956,000.

Copper output was estimated at 739,754,000 lbs. compared with 750,842,000 lbs. in 1948.

Accurate statistics were not available for non-metallics such as barite, clay, silica, sand, feldspar, gypsum, pumice, perlite, rock wool and others, but the department indicated all have grown in 1949.

Uranium exploration was expanded, particularly on the Navajo Indian reservation, and Dunning reports the state now is second in production only to Colorado.

★Arizona has recorded its best safety record in the state's mining history with only four deaths in the industry in 1949. This compares with 18 in 1948.

During 1949 there were only 360 mine accidents. An average of 3,343 men were employed underground and 3,565 above ground.

Phelps Dodge Corp., largest operator in the state, had no fatalities. **Magma Copper Co.** had one, resulting from falling rock; **Skyline Mine** had one as the result of a miner falling, and **American Smelting & Refining Co.** had two as the result of a dynamite explosion.

★Globe-Miami Arizona mining companies and the Metal Trades Council, AFL, have completed a contract calling for a wage increase of 40 cents a work shift, retroactive to Dec. 16.

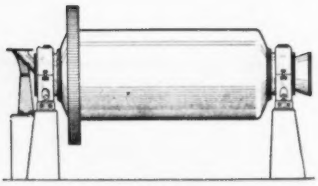
There are about 2,800 workers in the area, 1,700 of whom will be affected by the new contract.

Companies having contracts are **Miami Copper Co.**; **Copper Dome Copper Co., Inc.**; **Copper Cities Transportation Co.**; **Inspiration Consolidated Copper Co.**, and **International Smelting & Refining Co.**

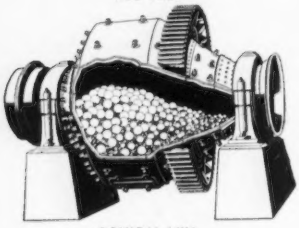
The firms agreed to study plans for off-the-job accident and health insurance to supplement group life insurance now available to employees.

CALIFORNIA

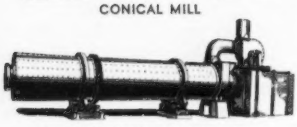
★**Whinnery Mining Co.** has reopened the Sarita and Chemung gold properties in the Masonic district near Bridgeport. Manager Page Blakemore reported that operations would begin early in the year on extensive surface bodies.



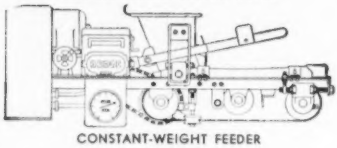
ROD MILL



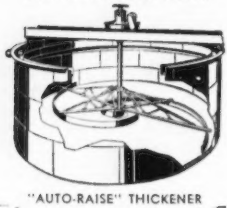
CONICAL MILL



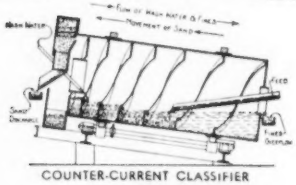
RUGGLES-COLES ROTARY DRYER



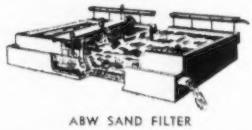
CONSTANT-WEIGHT FEEDER



"AUTO-RAISE" THICKENER



COUNTER-CURRENT CLASSIFIER



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California *(Continued)*

★The Domingo gold mine near Hornitos in Mariposa County has been unwatered and reconditioned by Richardson Brothers and J. O'Brien, who plan installation of a mill when satisfactory tonnage of ore is blocked out.

★A gold dredging operation was scheduled to start early in 1950 on the Chowchilla River in the Raymond district in Madera County by the **Chowchilla Dredging Co.** The property to be worked is owned by Walter H. Edmonds, a limited partner in the firm. The Chowchilla operation will be the first large-scale dredging done in the county.

★The Brush Creek Mine near Downieville was destroyed by fire late in December. The mine is owned by **Alpha Stores, Ltd.**, of Grass Valley and Nevada City.

★A 2,400-ft. tunnel is being extended into a lava cap formation in the Bear River region 25 mi. southeast of Grass Valley by the **ALA Mining Co.** The company is seeking the extension of the historic Mammoth Spring gravel channel. Controlled by G. E. Arbogast, Los Angeles, and associates, the company owns 600 acres of lode and placer ground along Bear River Canyon, including the Mammoth Springs, Mammoth Lode, Foss and East New York properties. Larry Lawson is manager of the operation.

★A number of gold mining properties are reported reopening in Sierra County. The Monarch gold mine near Sierra City has been rehabilitated by **Sierra Monarch Mining Co.** and is scheduled to go into substantial production early this year. Three Diesel engines have been installed for a total of 500 hp., and construction is under way on a mill to treat 100 tons of ore daily. Development work has been resumed and mining is proceeding on the main levels with about 200 men employed. William C. Ennis is general manager.

Original Sixteen-to-One Gold Mining Co. is working its Sixteen-to-One property in the Alleghany high-grade ore district, milling more than 100 tons of ore daily and employing some 50 men.

Cadmus Mines is preparing to reopen the Pilgrim Lode Annex and American Hill gold mines near Forest.

The Kate Hardy mine, also near Forest, is reportedly going to resume gold ore milling on completion of work improving roads to the property. The mine, equipped with a 10-stamp mill, has been worked during the last seven years by Hugh and Phillip O'Donnell under lease.

COLORADO

★Cripple Creek Mining and Milling Co. has leased the El Paso mill tail-

ings dump at Gillette, near Cripple Creek. Elmer Johnson, Visalia, Calif., is general manager of the Cripple Creek company. The dump is estimated to contain about 100,000 tons, averaging about $3 per ton in values. A new 10-ton dry-land placer machine has been purchased. This is expected to handle 60 tons of dirt per hour.

★**Wanamaker Mining & Milling Co.** has been formed by W. M. Dickerson, C. L. Proe, and James Adams to revive an old gold producer at Sky City, 61 miles from Saguache, in the Big Park mining district. Mr. Dickerson hopes to have the mine and mill in operation soon. Concentrates containing values in gold, silver, copper and some lead will be hauled by truck. An old tunnel on the property has been cleaned out and retimbered for a distance of 850 ft.

★A new uranium processing plant may be built in the Grand Junction area. The *Pittsburgh Post-Gazette* says the Vitro Manufacturing Co. of Pittsburgh, Pa. is considering a plant at Grand Junction to cost in excess of $500,000. The report also says the company might locate another plant near Marysvale, Utah, if a recent uranium ore find there proves suitable. Vitro, engaged in extracting radium and uranium since 1929, now uses scrap materials from Government projects in its plants at Canonsburg, Pa.

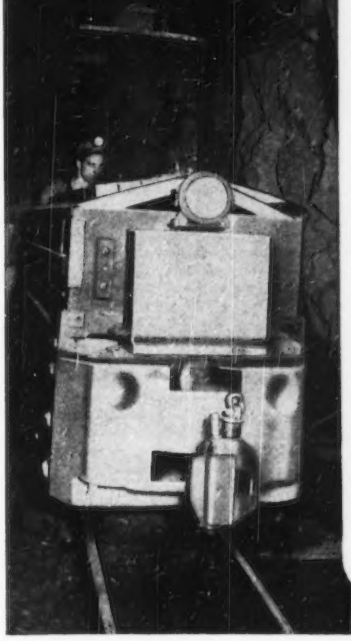
★Approximately 225 employees of the **Resurrection Mining Co.** at Leadville agreed to accept a pay reduction of $1 per shift effective January 1. The action was announced by M. E. Newlove, general manager, and S. Wesley Johnson district organizer for the American Federation of Labor. No reduction in the six-day work week is contemplated. Part of the agreement calls for a metal price bonus under which workers will receive additional pay as the price of metals goes up. Should the combined price of lead and zinc reach 28c. per pound, the $1 pay cut will be restored.

★A seven-carload shipment of milling equipment, left Denver on the first leg of its journey to a South American copper mill, recently. The grinding mills, designed and built by the Marcy Mill Division of the **Mine & Smelter Supply Co.** of Denver represents more than a million dollar order. Under construction since last February, the mills will equip one-third of the plant now being built in Chile at a cost of more than $56 million. When completed in 1952 the mill will have a capacity of 50,000 tons of ore a day.

★The **Chain O'Mines** mill, Gilpin County, has started up recently on a trial run of ore from the Patch orebody. Results were reported satisfactory. Seventeen men are employed in the mill at present.

★**Montana Mining Development Co.** has bought the Lamartine mill and

How to keep them ON THE GO!



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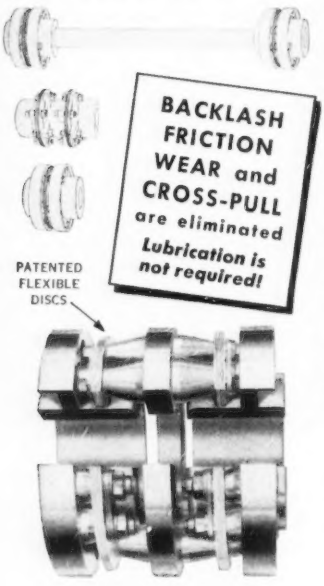

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Colorado *(Continued)*

concluded purchase contracts on the Lamartine group of claims, and lease with purchase contracts for the Oneida mine. The company plans to start work after the holidays. Charles R. Anderson and his brother, James, of Lewistown, Mont., will be in charge of mining and milling operations. Mr. Anderson says they hope to employ about 25 local men.

★W. O. Erickson, who bought the Columbus mine at Animas Fords four years ago, has equipped the mill with stamps. The 50-ton mill is powered with diesel and gasoline engines. Winter snows block the road to Silverton about five months a year, so stores have to be accumulated for the winter isolation period. These include 100 drums of fuel oil, 100 tons of coal, truckloads of groceries, dynamite and powder. Mail and light supplies are brought in by skis or snowshoes from Silverton.

IDAHO

★The **Coeur d'Alene Mines Corp.** and **Merger Mines Co.** are sharing the expense of driving a crosscut to the Commodore Truxon vein from Coeur d'Alene Mines 2,800-ft. level, according to C. H. Hunter, president of Merger Mines. Coeur d'Alene Mines has recently driven a drift westerly from the deep shaft to prospect this territory and a recent diamond drill hole south from the crosscut intersected what is believed to be the Commodore Truxon vein. It will take 450 ft. of new crosscut work to intersect the vein system. The companies will share on a 50-50 basis from any ore production profits.

★**The South Fork Mining & Leasing Co.** is preparing to dredge five miles of gold-bearing gravel in Buffalo Gulch, near Elk City, Idaho, according to Walter Hovey Hill, mining engineer of Grangeville and consultant for the company.

"Testing operations in the area were started last September," said Mr. Hill, "under the direction of D. R. Ingraham, dredgemaster, and myself, representing the owners. Our tests showed heavy alluvial minerals, gold, ilmenite, zircon, tin and much monazite, which, besides the gold, may become a source of additional profit."

★**Silver Star-Queens Mining Co.** at Hailey, Idaho, has unwatered the Minnie Moore mine Rockwell shaft and will develop the adjoining Star-Queens property from the 450-ft. level, thus gaining approximately 100 ft. of depth below the old Star-Queens workings.

★**Highland Surprise Mining Co.** has sunk its main shaft from the 1,300-ft. to the 1,500-ft. level. The company will also develop the adjoining Nevada-Stewart property from the 700-ft. level. This will require about 500 ft. of tunnel work.

★**Bunker Hill & Sullivan Mining Co.** is now milling 1,000 tons of low-grade lead-zinc-silver ore in addition to its regular high-grade tonnage. Ores are produced by a mass caving method under the direction of Charles M. Schwab, mining engineer. Ores averaging about 3% combined lead and zinc and ½ oz. silver are being produced from a block estimated to contain about 5,000,000 tons of low-grade ore in old workings, below the town of Wardner. (See *E&MJ*. July, 1949.) Several other blocks of ore will be mined by this method in the Bunker Hill property if the pioneer experiment proves profitable.

★**Silver Dollar Mining Co.** has resumed work on a crosscut which is being driven from the 1,800-ft. level into the Purim group of claims. Work had advanced 1,000 ft. before the strike. The crosscut will develop a section of the Silver Belt east of the Sunshine mine.

★**Callahan Consolidated Mining Co.** has been drifting on the American Silver vein on the 2,800-ft. level of Coeur d'Alene Mines under a production agreement. This work is about 3,000 ft. south of the Coeur d'Alene Mines shaft. Recently the tunnel work encountered a north-south vein structure containing low-grade copper and silver values. Thus far advance on the vein failed to disclose improved values.

★**Clayton Silver Mines Co.** is now producing and milling 100 tons of ore daily from the 300 and 400-ft. levels. The mine at present is making 600 gal. of water per min. Three Ingersoll-Rand GT pumps have been installed on the 400-ft. level, each rated at 400 g.p.m. against a 400-ft. head. Three smaller pumps are also maintained to provide increased pumping capacity if needed.

★**Sunshine Mining Co.** is installing a new Ingersoll-Rand air compressor of 2,000-cu. ft. capacity. Total compressed air capacity of the company's plant will be increased to 8,000 cu. ft. per min. The company has also installed new pumps to increase the mines pumping capacity to 550 g.p.m. Sunshine's normal flow is about 180 g.p.m., but water encountered in the Metropolitan crosscut has increased this considerably.

★The Galena shaft on the Vulcan property in Lake Gulch west of Wallace, which is being financed by **AS&R** and **Day Mines, Inc.** is now past the 2,650-ft. mark. Ultimate objective is 3,000 ft.

IRON COUNTRY

★Twelve employees of **Oliver Iron Mining Co.** in the Coleraine district who have served the company 25 to

40 years were honored at a dinner held at the Rainbow Club at Grand Rapids, Minn. E. A. Friedman, district superintendent, presented the awards and J. E. Machamer, vice president, paid a tribute to the group.

★A meeting of the Minnesota Executive Council which had been set for Dec. 10 to consider the applications for lease extensions of the Tioga, Wacootah and Kevin mines, was postponed by Gov. Youngdahl to give more time for study. The mines are controlled by the **Western Mining Co.**, of Cleveland; the **Wheeling Corp.**, of Wheeling, W. Va., and **Butler Brothers**, St. Paul, respectively. New 25-year leases are being asked by the companies.

★The last boat to leave the Great Northern Railway's docks at Superior, Wis., with iron ore was the "E. T. Weir" of the **M. A. Hanna Co.** which cleared Dec. 4, five days earlier than the last boat of 1948. The Great Northern's dock loadings for 1949 totaled 22,399,287 tons, over 4 million tons less than the tonnage handled in 1948. C. G. Andrus, weather bureau chief at Cleveland, set the end of the Great Lakes shipping season at Dec. 13. On that date the display of storm warnings and the broadcasting of Great Lakes bulletins ended.

★Lake Superior iron-ore shipments for the 1949 season as of Dec. 12 from both United States and Canadian ports amounted. to 65,556,269 tons, over 13 million tons less than the 82,937,192 tons which went down the Great Lakes waterway in 1948. Final adjustments will probably change this figure very little.

★**Stanley Mining Co.'s** Mary Ellen mine at Biwabik shipped 300,748 tons in 1949, making a total of 993,945 tons shipped. It requires an inspection of the mine to appreciate this achievement.

★The Elbern mine, near Chisholm, a new property operated by the **Haley-Young Mining Co.**, of Hibbing, shipped 149,527 tons in 1949 compared with 69,506 tons last year. Based on estimates as of May 1, 1948, there is still more than 400,000 tons remaining in the mine.

★Diamond drilling is being continued at **Butler Brothers'** (M.A. Hanna) Harrison group of mines at Cooley.

★The big dragline at the South Agnew mine has finished the stripping work which was assigned to it. Most of the surface material remaining will be handled by standard shovels. It is expected that the drag will have its next job at the Morton mine which has been idle since last worked by the Tod-Stambaugh Co. in 1917 as an underground operation. The mine then was handicapped with considerable water. Repairs to plant and equipment are being carried on at the South Agnew in preparation for the 1950 season.

★M. A. Hanna Co. has installed a

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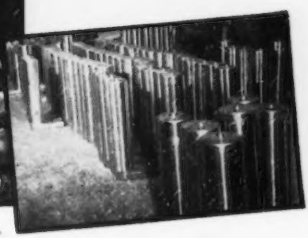

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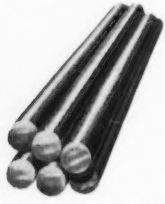

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Iron Country (*Continued*)

deep-well pump in the old Morton mine shaft and is pumping from it in preparation for stripping. Work will begin soon with an electric standard shovel.

★**Hedman and Strand** shipped 12,071 tons from the old Croxton mine near Chisholm in 1949. The last previous shipment was in 1914 when it was operated by **M. A. Hanna Co.** Hedman and Strand also shipped 30,496 tons from the Drew mine, near Chisholm, last operated in 1934 by the **Dohm Mining Co.** Shipments from the two mines totaled 42,567 tons.

★The Minnesota State Executive Council received 53 bids on 37 mining units from 12 bidders on Dec. 12. The various properties are located on the Mesabi and Cuyuna ranges. **Oliver Iron Mining Co.** lead with 17 bids followed by the **W. S. Moore Co.** of Duluth with nine; **Pacific Isle Mining Co.** of Hibbing with six; **E. W. Coons Co.**, Hibbing, five **Zontelli Brothers**, Ironton, three; **Iron Range Mining Co.** (D.M.&Co.) three; **Cleveland-Cliffs Iron Co.** two; **Hanna Ore Mining Co.** two; **Syracuse Mining Co.** (P.M.&Co.) two; **Joseph A. Lovallo**, Mountain Iron, two; **Rhude and Fryberger**, Duluth, one and **Harold A. Engman**, Virginia, one.

★**Inter-State Iron Co.'s** 1949 shipments, all from the Mesabi range, totaled 2,735,497 tons as compared with 3,580,173 tons shipped in 1948. As has been true for many years, the Hill-Annex mine at Calumet was the company's largest shipper with 842,244 tons. The Longyear mine at Hibbing was a fairly close second with 659,359 tons. The Columbia, at Virginia, had 581,692 tons, and the Grant, at Buhl, 368,218 tons. The balance was made up of shipments from the Sullivan No. 2 at Calumet (mined by the Hill-Annex) and ore mined by the Inter-State from the Oliver company's Sauntry mine adjoining the Columbia. The Inter-State has a busy winter program of stripping, repairs and plant changes at its mines.

★**Cleveland-Cliffs Iron Co.** has given a contract to A. Lindberg & Sons, of Ishpeming, for stripping about 40 ft. of surface from an estimated 80,000 tons of iron ore at the east end of Lake Angeline and within the city limits of Ishpeming. Most of the ore is of a good grade. Because the water level in Lake Angeline is rising, it is considered necessary to mine this ore soon.

★The Bureau of Mines has released a report (I.C. 7526) on conveyor haulage in five underground iron mines in the Lake Superior area. Three of the mines are on the Menominee range near Iron River, namely the Sherwood, of **Inland Steel**; the James, of **Pickands, Mather & Co.**, and the Tobin, of **Republic Steel Co.** One, the Morris mine, of

Pickands, Mather & Co., is at Keewatin, Minn., on the Mesabi.

★Forty supervisory employees of **M.A. Hanna Co.**, including superintendents, mining captains, foremen and shift bosses, met at Iron River on Dec. 13 for dinner and the monthly safety meeting. John R. Quayle, Homer mine captain, was chairman.

★For several hundred years **M. A. Hanna Co.'s** Wauseca mine at Mineral Hills has had a smouldering sulphur fire on its 6th level, covering an area of about 60x80 ft. Although it was isolated by bulkheads, sulphur fumes did sometimes escape into other workings. Efforts were made to devise a plan that would free the mine permanently from this menace. Two months ago work was begun on drilling 200 2½-in. holes, 10 to 50 ft. deep in the floor pillar of the 6th level stope on Dec. 17. These holes, loaded with 3,500 lb. of 45% dynamite, were blasted from surface, under the supervision of mine superintendent R. C. Mahon and two powder specialists, Joe Bastion, of Ironwood, and Bob Fowler, of Duluth. The breaking up of the floor by the blast dropped the ground of the burning area down 200 ft. Surface sand will be run in to smother the fire.

★The Sherwood mine, Iron River, Mich., was the winner of the **Inland Steel Co.'s** safety award for making the best showing among the company's producers of raw materials. The Inland limestone quarry and plant at Manistique finished in second place. During the last 12 months there was only one lost-time accident. P. D. Pearson is superintendent.

★**Jones & Laughlin's** Vicar mine on the Gogebic range found that the heavy flow of water recently experienced was coming from a vug. After two months' pumping the mine flow is back to its normal of 250 gpm. A similar experience was had at Mather "A" mine at Ishpeming several years ago that almost drowned the underground workings.

★At **Cleveland-Cliffs'** Mather "A" mine, Ishpeming, Mich., a new steel stocking trestle 65 ft. high and 550 ft. long, that will stock a million tons of iron ore has been erected just south of a similar trestle used for the same purpose. To eliminate delays a double track has been added from the shaft house to service this trestle.

At Mather "B" mine, good progress is being made on the surface equipment. The steel work on the headframe has been completed. Work on the dry is being rushed for the convenience of employees. In the engine house the 84-ton flywheel for operating hoists is in place and the intricate electrical equipment is being installed as fast as possible. This work will probably be completed in February. The skips will hardly be in operation before April.

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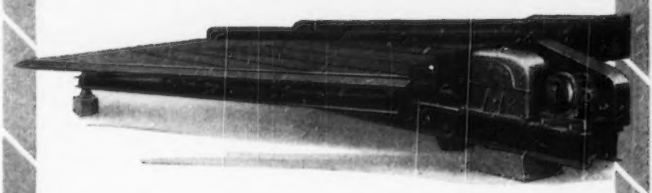

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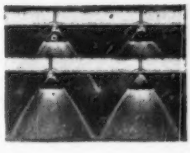

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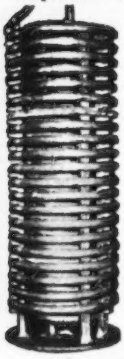

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Iron Country *(Continued)*

★The new 10,000-hp. steam plant of the **Cliffs Power & Light Co.**, at Ishpeming has smoke coming from its chimney but it will be some time in February before it is in operation. It was built by Stone & Webster and will supplement the five hydroelectric plants.

MICHIGAN

★The December meeting of the Lake Superior Mining Safety Council was held at Ishpeming on Dec. 7. Some of the papers presented were: "Support of Ground with Steel Sets," by F. J. Haller, superintendent of Mather "A" mine (C.C.I. Co.); "Safety Experience in Block Caving," by John Trosvig, superintendent, Athens mine of C. C. I. Co.; "Safety Experience with Mill Raises at the Sherwood Mine (Inland Steel) by P. D. Pearson, superintendent; "Experience with Short Period of Delay Blasting Caps," by R. W. Edwards, assistant superintendent Greenwood mine (Inland Steel). Other interesting papers were on "Use of Cleaning Fluids," "Shop Safety" and "The Foreman's Responsibility for Safety of Employees."

★**Pine Hill** quarry east of Eagle Mills, in Marquette County, has suspended all operations after 30 years of operation.

★William Kemsley, Detroit, educational director of the Michigan CIO Council, was again the principal speaker at the second annual educational institute held at Caspian, Mich., on Dec. 8. The purpose of the institute is "to weld Iron County CIO union members into a cohesive, informed opinion with impact in public affairs and at the ballot box." Topics discussed were radio technique and dissemination of press information, unemployment and workmen's compensation, and political action.

★The "Wilfred Sykes," **Inland Steel Co.'s** new ore carrier, largest and fastest on the Great Lakes, with a capacity of 20,000 tons, has made a satisfactory trial run. It is expected to make the 1,662-mile round trip between Duluth and Indiana Harbor in five days, one and a half days less than the time made by present freighters. If this rate can be maintained, the new ore boat will make 44 round trips for the shipping season, or 10 more than the average. At 22,000 tons per trip she would carry 880,000 tons of iron ore down the lakes in a season.

★**Bethlehem Steel Corp.'s** El Pao iron mine in Venezuela is expected to make its first shipment of ore in 1950. The mine is an open-pit operation and ore will be hauled 30 miles by rail to the Orinoco River and then about 200 miles by 4,000-ton barges to the ocean where it will be transferred to 25,000-ton ocean vessels for haulage to the Sparrows Point plant.

NEW DISCOVERY of uranium ore in Michigan is marked by symbol. The ore is uranium oxide in the form of pitchblende or uraninite. Jones & Laughlin Ore Co. made the discovery.

★**Calumet & Hecla** production is better than usual. No development work has been done during the past few months and more men have been available for production. It is estimated that December shipments of refined copper exceeded 7,000,000 lb. The amount of copper rock coming from the mines keeps the Ahmeek stamp mill operating at capacity. Only an increase in the price of copper will enable the company to resume development work.

A new product, Prozite, is being marketed by Calumet & Hecla. It is used extensively for metal finishing in the automotive industry, but its application is not limited to that field. It is a product of the conglomerate sands at the Lake Linden reclamation plant, combined with other materials. It is produced in bars.

After a lull of several months, **Calumet & Hecla's** secondary department is active again. Copper bearing scrap is purchased throughout the United States and shipped to Hubbell, where the copper is reprocessed and refined. The company's chemical department also is producing different copper oxides and hydrates for nationwide consumption.

Calumet & Hecla's $2,500,000 power plant at Lake Linden has been completed and placed in commission. At the time plans were drawn over two years ago, it was estimated that the new plant would use about 2,500 tons of coal per month less than the old plant. Indications are that the anticipated saving will be realized.

The company's drill bit plant is being expanded. This plant manufactures the Liddicoat bits used in Calumet & Hecla underground drilling operations. It also makes bits for sale to other users. The company is licensed to sell these bits in 37 eastern states. Full-scale production is assured.

★**Copper Range Co.** is producing on a small scale, milling from 18,000 to 20,000 tons of copper rock per month from its Champion mine. The concentrates produced in the mill at Freda are reduced at the **Calumet & Hecla** smelter at Hubbell.

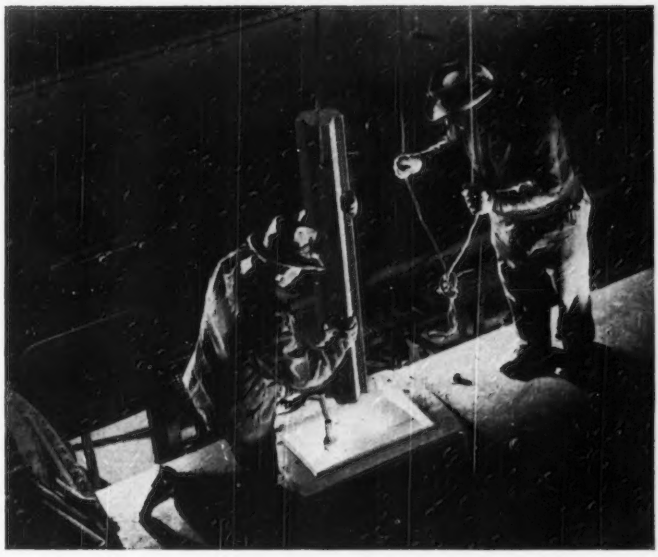
Diamond drilling is proceeding in the company's White Pine lands in Ontonagon County. Drilling to date has indicated the presence of a large reserve of low-grade copper, which in all probability will be the scene of a large-scale underground mining program in the future. From a shaft sunk in 1945, a total of 34,000 tons of ore has been mined for large-scale mill tests at Freda. The copper occurs in sandstone and shale beds and, while low-grade, is remarkable for consistency and uniformity. Over 8,000 ft. of development work has been done since the shaft was started. The White Pine land holdings are extensive, occupying a large block between Lake Superior's shore and the west branch of the Ontonagon River.

At Redridge on Lake Superior, Houghton County, the **Copper Range Co.** has a reserve of stamp-sand tailings estimated at 8,200,000 tons, averaging 7.5 lb. of copper per ton. These sands are from the operations of the former Baltic, Atlantic, Mu-chugan, and Superior mining companies. At Gay, on Lake Superior, the company's sands are estimated at 12,800,000 tons, averaging 5.6 lb. of copper per ton.

★In six years of operation, **Quincy Mining Co.** has recovered 33 million lb. of copper in its reclamation plant at the stamp sand tailings deposit at Mason on Torch Lake, Houghton County. The company is now about half way through the reserve of stamp sands. The Quincy plant was built during the war and an RFC Government loan financed the construction. The debt was paid off in four years from earnings from this operation. The plant works day and night during all seasons of the year. The concentrates are reduced in the company's own smelter at Ripley, Portage Lake, Houghton County.

NEVADA

★Nevada maintained its position as the nation's fourth largest gold producer in 1949, with a substantial gain above the 1948 output. Increase was due largely to production from the Greenan placers in the Copper Canyon field by **Natomas Co.**, and mining and milling of ore at Goldfield by



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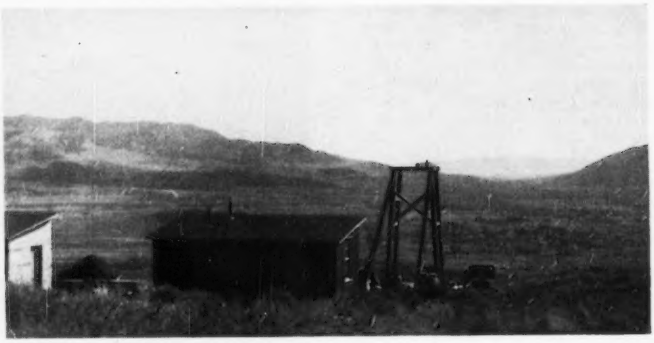

RADIOACTIVITY has been detected for 475 ft. along strike of grano-aplite dike at the Free Enterprise group near Boulder, Mont. This shaft will be used for further exploration work. Uranium minerals found include carnotite and torbernite. Photograph courtesy of The Boulder Monitor.

Nevada *(Continued)*

Newmont Mining Corp. Kennecott Copper Corp. remained Nevada's leading gold producer, recovering the metal as a byproduct from copper ore mined at its Nevada Consolidated property near Ely.

★Nevada - Massachusetts tungsten mine and mill in Pershing County resumed operations Jan. 2. It had been shut down since June 25 because of "the general economic situation." The mine employing 160 workers, has signed a one-year contract with local 893, IUMMSW.

★**Consolidated Goldacres Co.'s** property in the Tenabo district has become one of Nevada's leading gold producers. Ore averaging $7 per ton is mined in open cuts with power shovels. The cyanide mill handles 350 tons of ore daily and value of monthly output is reported to exceed $60,000. Diamond drilling indicates that enough ore is available for 15 years' operation at present rates.

★Dodge Construction Co. has installed a power shovel on the Golden Queen placers in the Sylvania district.

NEW MEXICO

★The strike by 1,500 members of the CIO Mine, Mill & Smelter Workers Union has tied up the nation's principal potash production at Carlsbad, N. M., since Nov. 19.

Representatives of three operating companies, **United States Potash Co., International Minerals & Chemical Corp.,** and **Potash Co. of America,** have been conferring on details of separate agreements with workers on such matters as seniority, transfers, promotions and working conditions. With these points settled the companies will bargain jointly with the union on the pay dispute.

Members of the International Association of Machinists, not on strike but honoring picket lines of the striking CIO workers, have been barred from entering plants.

The striking union is asking for a straight 25c. per hour increase in wages. The companies at first offered a new contract which would tie wages to the cost of living index, but on Dec. 12 offered to reinstate the old contract as it was prior to the strike, and which they had cancelled shortly after, on Nov. 23. The old contract provided for $2.00 an hour base pay.

★After considerable testing in the potash field east of Carlsbad the **Duval Texas Sulphur Co.,** Houston, Tex., is constructing a plant and preparing to start sinking its first shaft. At the time these plans were announced by Howard Van Zandt, land manager for the Texas company, it became known that W. Page Morris, mine superintendent for **International Minerals & Chemical Corp.,** and George E. Atwood, metallurgical superintendent for the same company, had resigned as of Dec. 31 to join the new company.

It is estimated locally that the cost of entering into potash production in the potash area runs between $6,000,000 and $8,000,000, depending on underground conditions encountered.

★National Labor Relations Board's counsel Robert N. Denham has asked for an injunction against Mine, Mill and Smelter Workers at Carlsbad, N. Mex., in connection with the potash strike. Hearing was to be heard at Albuquerque on Jan. 10, before Federal Judge Carl A. Hatch.

NORTH CAROLINA

★Through a method developed by the Tennessee Valley Authority and North Carolina State College, iron-stained talc in the Murphy, N. C., talc area which previously has been discarded will be reclaimed by a pri-

vate firm which will put the talc through a new bleaching plant at Murphy.

OREGON

★Seven Oregon operations were actively engaged in production of pumice aggregate during 1949. Two of these produced 8,500 cu. yd. in conjunction with company-owned block plants. In 1946 there were six established operations. As many as 12 are understood to have been active in 1947 and a total of nine operations were engaged in full or part time production in 1948. Production in 1948 totaled 170,500 cu. yd., valued at about $305,000. Incomplete reports indicate the 1947 production was in the neighborhood of 130,000 cu. yd. Oregon producers in 1949 were:

Central Oregon Pumice Co., Lloyd A. Williamson, Pumice Engineering Co., and **Volcanic Materials,** all of Bend;

Wisby Bros., Chemult;

Deschutes Concrete Products Co., Redmond;

Harney Concrete Co., Burns.

★Fine gold worth from two to six mils per ton of gravel is being washed out of the sand of the Columbia River during McNary Dam construction. A byproduct of the $227-million construction job, the gold mining is combined with the work of mixing sand and gravel for the dam. E. Goody, Tacoma, Wash., who conducts the operation, gives 10% of the gold to J. G. Shotwell, Hermiston, who produces the sand and gravel mix, and 10% to the Government. Col. William Whipple, Walla Walla district Army Engineer, says the gold just about pays the wages of one of the mixing crew workers.

★Foreign quicksilver imports have forced the closing down of the Bonanza cinnabar mine 8 mi. east of Sutherlin. The mine had been in almost continuous operation since 1887. Peak production of 500 to 600 flasks daily was reached during war years, but it had dropped to 150 flasks at the time of the closure. Bert Avery, mine foreman, explained that domestic demand for quicksilver far exceeded the supply in the United States, which prompted the request for importations. As a result the market price was forced down to the unprofitable level of $72 a flask.

TENNESSEE

★The Southeastern regional office of the Bureau of Mines is being transferred from Tuscaloosa, Ala., to Norris, Tenn. Bureau Director James Boyd said that the determining factor in the transfer was the extensive office and administrative facilities at the Norris experimental station.

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Tennessee *(Continued)*

North and South Carolina, Georgia, Florida, Alabama and Mississippi.

Hewitt Wilson, administrative head of the station at Norris since 1938 will be the new regional director. He succeeds J. Bruce Clemmer, who has been sent to Tucson, Ariz., where he was engaged in metallurgical research before his recent assignment as regional director at Tuscaloosa.

UTAH

★Mining interest in Utah is again focused on the uranium picture, with ore-handling problems growing out of the Marysvale autinite deposits a center of concern. On Dec. 26 Representative Walter K. Granger (D., Utah) told the mining industry that early establishment of a uranium ore purchasing depot at Marysvale is planned by the Atomic Energy Commission. He likewise gave assurances the AEC promises construction of a processing plant for the district's uranium ore whenever there is an assured supply to justify the cost. Jesse C. Johnson, manager of AEC raw materials operations, expressed hope plans could be completed regarding purchase of Marysvale ore by the end of January.

The market for the Marysvale area was largely cut off in October when the **U. S. Vanadium Corp.** notified AEC of a decision to end purchases in the district because its Rifle, Colo., plant is now operating at capacity on Colorado plateau ores. More than 1,000 lbs. of typical Marysvale ore is currently being analyzed by U. S. Bureau of Mines laboratories.

Later in December, A. N. Cooper, treasurer of the **Bullion Monarch Mining Co.**, active at Marysvale, predicted speedy establishment of a mill for the handling of autinite. He stated conversations with Mr. Johnson indicated the AEC will have set up its buying depot by Feb. 1, with milling facilities to be established soon afterwards. Three additional firms are pressing for establishment of such a mill, according to Mr. Cooper, **American Smelting and Refining Co., Vitro Manufacturing Co., and Vanadium Corporation of America.**

The Bullion Monarch executive states his firm has indicated reserves of 500,000 tons of autinite, a secondary uranium-bearing ore. The uranium oxide content, on which Government payments are rated, is said to run from .7% to .26% on the total tonnage. This is a composite figure obtained by the AEC on three 20-ton carload shipments. Cooper reports there would be "no difficulty in milling the ore or reducing it," and that AEC payment for autinite will be on the same basis as for carnotite ores, "at least for the time being."

Meantime, the AEC has defended itself against charges raised against its uranium purchasing program by small Utah producers, terming present operations "satisfactory."

PROSPECTING FOR URANIUM involves a good deal of digging right at the surface. Two miners here break up surface deposit at the Cactus Rat mine in southeastern Utah.

J. K. Gustafson, former manager of AEC raw materials operations, before his recent resignation, in a letter to James K. Richardson, manager of the Utah Mining Assn., reported: "We have tried to set up the Colorado plateau problem on the basis of free enterprise insofar as it is possible to do so. This approach has resulted in satisfactory production with a minimum of Government assistance and . . . interference."

Mr. Gustafson added: "It should not be forgotten that our operations on the plateau are justified only because they give us a limited domestic supply of uranium, although it is high cost uranium."

Mr. Richardson, spokesman for Utah mining groups, had asserted that present sampling methods by AEC stir some distrust, and had recommended establishment of easily available assay offices in southern Utah to handle ore. Mr. Gustafson replied that umpires handle questions between buyers and sellers when there is a price disagreement, and likewise replied offices at Grand Junction, Colo., are seemingly sufficient to handle Utah assays.

★Tom Lyon, director of the **Dragon Consolidated Mining Co.** of Utah, reports discovery of an indicated reserve of nearly 500,000 tons of halloysite, a hydrous aluminum silicate, on the company's properties south of Eureka. An estimated 200,000 tons of the clay, used as a catalytic agent in oil refining, was blocked out in the past year. Shipments to the Filtrol Corp., Los Angeles, are now averaging nine 50-ton cars weekly.

Filtrol Corp. is said to be considering plans for a processing plant in the Salt Lake City region that could handle up to 1,000 tons a week. Mining men are pleased by the prospect, since the Tintic district in which Dragon Consolidated is located has

been slowed in its normal operations by the lead-zinc price lag.

Although halloysite has been used in centrifugal casting molds and as firebrick, operators of the mine feel the ready market is in oil refining.

★The $3,500,000 copper anode bar casting plant being erected by **American Smelting & Refining Co.** at Garfield was 50% complete as of Jan. 1. R. D. Bradford, general manager of the company's Utah Department likewise reported work "progressing satisfactorily" on the $7,000,000 expansion program of the **Garfield Chemical & Manufacturing Corp.** nearby. This facility is jointly owned by **AS&R** and **Kennecott Copper Corp.**

★Despite recent metals price difficulties, the **International Smelting & Refining Co.** spent nearly $500,000 during 1949 in hunting ore within Utah's borders. F. A. Wardlaw, Jr., general manager of the concern, said about 12,000 ft. of tunnels, drifts and crosscuts were driven, supplemented by diamond drilling in the Tintic, American Fork and Ophir districts.

Describing the IS&R program as "venture capital at work," Wardlaw said, "Although results in general have not been too encouraging it is expected this exploration program will continue wherever developments justify the expenditure."

★Hopes of a lengthy labor peace at Utah Copper Division operations of the **Kennecott Copper Corp.** brightened with announcement Dec. 20 that the International Association of Machinists, bargaining agent for 250 mine shop employees, has agreed to extension of its present contract through June 30, 1951. Only major contract change listed was an increase of 40c. per eight-hour shift.

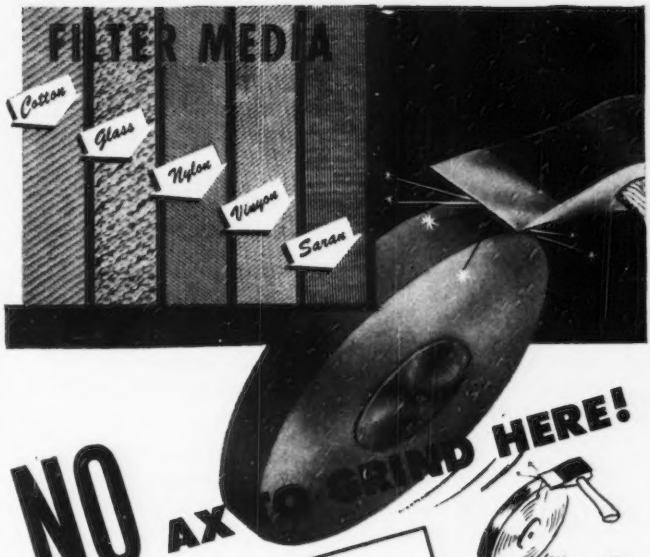
★**Kennecott Copper Corp.'s** Utah Copper Division returned to a 48-hour work week Dec. 26. Monthly earnings of some 3,000 mine and mill workers will thereby be boosted 30%.

Kennecott's Utah mine and mills slowed to a 40-hour work week May 23, 1949, the cutback from a 48-hour week being effected by a complete operating shutdown for two days every other week.

Elimination of the four shutdown days each month has been made possible by increased copper sales and a somewhat improved pricing situation.

Paul H. Hunt, vice president and general manager of **Park Utah Consolidated Mining Co.,** has been named president of the Utah Mining Association for 1950.

Members re-elected include **A. G. Mackenzie,** former association manager, who will serve as vice president. Second vice president is W. C. Page, assistant to the vice president and general manager of western operations for **United States Smelting, Refining & Mining Co.** Third vice president is R. D. Bradford, Utah department general manager for **American Smelting & Refining Co.** James K.



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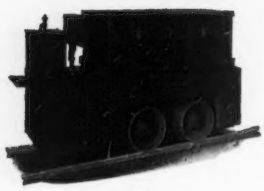

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Utah *(Continued)*

Richardson continues as association manager.

★Officials of two major Park City mines, Utah State officials and union leaders have again failed to reach any agreement looking towards reopening lead-zinc-silver operations which have been down since July, 1949.

The latest in a series of December meetings (Dec. 15) was called by Utah Labor Conciliator Dan Edwards to study incentive pay proposals under which **Silver King Coalition Mines Co.** and **Park Utah Consolidated Mines Co.** properties might resume operations profitably. However, the session ended with "nothing decided on the incentive pay plan, and with no future meetings scheduled between companies, union and state conciliators." The union involved is the CIO Progressive Metal Workers Council. Approximately 700 men are now idle at Park City, with state officials seeking to set up work projects for many of them on roads in the region.

★Although **Park Utah Consolidated** operations at Park City have been suspended since July due to metals prices difficulties, exploration work has been continued "rather successfully," according to Paul H. Hunt, vice president and general manager of the company. "A substantial lead-silver orebody" has been uncovered on the 1,700-ft. level of the workings.

The new orebody was reported discovered as a result of driving on a mineralized section running from the 1,700 to the 1,500-ft. level. Park Utah officials had previously reported an orebody on the 1,600-ft. level and theorized that it might extend in substantial form to the lower level.

WASHINGTON

★Maximum production was expected to be attained at the **Pacific Northwest Alloys** plant at Mead the middle of January, after its shutdown due to the steel strike, according to W. T. McGinnis, manager of the ferrochrome and ferro-silicon plant.

★**Spokane Molybdenum Mining Co.** plans to erect a mill at its property in Lincoln County, 18 miles north of Davenport, this summer. Only 100-ton equipment will be installed this year, according to Luke J. Bailey, president, but the mill building will be large enough to handle 500 tons. During the past 15 years about $200,000 has been spent in exploratory work on the 5 claims and 40-acre campsite.

★**Gold Syndicate Corp.** announced through its president, Frank Lilly, of Spokane, that it had sold a 12-oz. gold nugget to an Alabama cotton manufacturer for $625. The nugget had been bought from a Spokane prospector who had taken it from a

sluice box in the Kobuk area, in Alaska, north of the Arctic Circle.

★Norwest Federation of Mineralogical Societies' 1950 convention will be held in Spokane, Sept. 2-4, according to Dale Lambert, president. Paul N. Brannan, convention chairman, said there will be displays by individuals, clubs and commercial exhibitors.

★**Mines Management, Inc.,** invited shareholders of **Silver Dollar Mining Co.** early in December to participate in the company's exploratory program in Stevens County where the Advance and Iroquois properties have been opened. The present offering is 1,200,000 shares at 25c. from which $22,000 may be returned to the Silver Dollar company for advances made on an open account. The prospectus filed with SEC shows that Mines Management has a tentative plan for acquiring a 200-ton flotation mill with mining properties and miscellaneous equipment at a price of $350,000 with $50,000 down and the remainder spread over an eight-year period. Chief values at the Iroquois and Advance are in zinc, lead and silver.

★**R. H. Mills,** Spokane, who brought suit in October against the **Tungsten Mining & Milling Co.** to recover possession of the Germania mine, near Fruitland in Stevens County, has had a cross suit for $50,000 damages brought against him by the company.

★Only five of the Mead potlines had been operated during two months due to power shortage, but on Dec. 14 the sixth potline went into operation with release of Bonneville power, and approximately 100 men returned to work at that time. Opening of the additional potline added 3 million lb. of pig per month to the output.

★Reopening of a natural epsom salts deposit in the upper Okanogan Valley was announced recently by **Laucks Chemical Co.** of Seattle. The deposit shows as high as 99.5% pure epsom salts ($MgSO_4 \cdot 7H_2O$), with production figures set at 6,000 tons per year.

★**Manganese Products, Inc.,** of Seattle, Wash., has paid $750,000 for a $5,600,000 plant built by the Government during wartime at Salem, Ore.

The plant has an annual capacity to process 30,000 tons of 35% manganees ore into 16,300 tons of manganese oxide containing 58% manganese and 22,700 tons of ammonium sulphate. The manganese will be sold to the Government while the ammonium sulphate will be sold for fertilizer, according to Dr. R. W. Moulton, technical director of the firm. Operation is scheduled to start in the spring.

WISCONSIN

★**Calumet & Hecla's** zinc and lead mines at Shullsburg, Wis., are in production. The mines are shallow, maximum depth being about 350 ft.

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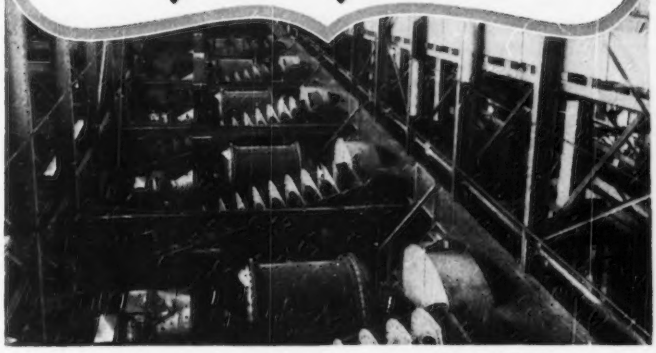

Quincy Mining Company's six 8 ft. x 6 ft. Hardinge Ball Mills on Torch Lake, Hancock, Mich.

Based on a 9 month test period ending June 30, 1949, the consumption of Sheffield Moly-Cop Balls was less than ⅓ as much as forged steel balls previously used by Quincy Mining Company in the six mills shown above. The forged steel balls were consumed at the rate of 1.55 pounds per ton of ore ground as against .49 lbs. of Sheffield Moly-Cop balls.

Actual cash savings were more than $30,000 in nine months, despite the original higher per-ton cost of Moly-Cop balls. The economy of Moly-Cop Balls has been proved in mining operations all over the world.

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IN CANADA

• Quebec Gold-Silver Output Gains
• Ontario Mine Profits Are Up

ONTARIO

★The Ontario Department of Mines reports that 43 producing gold mines in the province milled 848,166 tons of ore in October to recover 197,829 oz. of gold and 37,637 oz. of silver valued at $7,695,628. This was the highest value since December, 1942, average grade was $9.07 per ton in gold. Employment reached a new high of 13,565 men. Total output of Ontario's gold mines for the first 10 months of 1949 was valued at $68,355,935.

★**Aunor Gold Mines Ltd.**, in the Porcupine camp, reports 1949 as the most profitable year since the war, due to improved grade. The mill rate of 483 tons daily has been held closely since 1948 and the ore grade is now close to the $13.40 (gold at $38.50) average of reserves. The main shaft has been deepened to 2,700 ft. and will be continued down to 3,200 ft. with a main operating level to be established at 2,875 ft. The common boundary with the Delnite mine is located about 4,500 ft. west of the shaft and will be approached by a long drift. It is expected to spend two years or more on the extensive development program. Several promising ore shoots have been indicated by the exploration that has been carried out by Delnite in the boundary areas, where the favorable band of andesite has increased to about 100 ft. in width. East from the shaft exploratory work is being carried up to the Buffalo Ankerite boundary on the 1,875-ft. level. Stanley S. Saxton is mine manager.

★**Delnite Mines Ltd.**, adjoining the Aunor mine, had its most successful year in 1949. The mill rate has been advanced to 425 tons a day, highest since 1943. Gold recovery last year averaged $9.81 per ton (gold at $35). W. V. Moot, president, says the improved mine performance is due to a normal labor supply. The new ore zone also has made a substantial tonnage on the deepest levels down to 2,875 ft. and its continuity has been indicated by drilling down another 850 ft. Ore developed in 1949 shows an average grade of $12.91 (gold at $38.50). The new zone is to be explored below the bottom level at 2,875 ft. by sinking an internal shaft 1,000 ft. deeper. The headframe will be raised to above the 2,750-ft. level to allow for opening ore and waste pockets. Delivery of the new hoist is expected in June; plans have been made for a start on shaft sinking next September. John Beattie is mine manager.

★**Lake Shore Mines Ltd.**, centrally located along the main Kirkland Lake break, reports production in 1949 marks a record for any year since 1941. In the first 9 months gold recovery amounted to $4,249,373 from 285,147 tons averaging $14.90 per ton. Government cost-aid was estimated at $127,000. The mill rate has been averaging 1,041 tons a day.

MANITOBA

★**Sherritt Gordon Mines, Ltd.**, reports that six more diamond drill holes have been completed below the 1,000-ft. level of the Lynn Lake "A" orebody. The orebody above the fault has now been pretty well outlined and shows normal grade and dimensions. Below the fault, the "A" orebody has been displaced to the southwest at a depth of roughly 300 ft. below the 1,000-ft. level.

What appears to be a new orebody has been cut in a drive started south to explore the "B" orebody underlying Lynn Lake itself. Stations will be cut to permit exploration of the new occurrence.

It is reported that Sherritt Gordon Mines, Ltd., and Berens River Mines will resume exploration of their copper-zinc option at Sourdough Bay, Lake Athapapuskow. During last winter diamond drilling from the ice gave favorable intersections over a length of 600 ft. Several anomalies remain to be explored.

★**Lee Gordon Mines** has been taken over by **Canus Petroleum Corp.**, which acquired 600,000 pooled vendor shares of the 1,200,000 shares originally issued for properties. Diamond drilling has commenced on the Vamp Lake property where previous work indicated gold, copper and zinc values.

★**Howe Sound Exploration Co., Ltd.**, reports that a mill rate of 2,000 tons daily is now being maintained from the Nor-Acme Mine at Snow Lake.

QUEBEC

★Gains of 35% in silver and 25% in gold output are reported by the Quebec Department of Mines for the first 10 months of 1949. Total silver recoveries in this period amounted to 2,567,560 oz.; gold, 785,820 oz. Asbestos production for the same 10 months was 435,610 tons, a drop of 26% from the same 1948 period. Cement and clay products were up 7 and 13%, respectively, while lime decreased.

★**Golden Manitou Mines Ltd.**, located about four miles southeast of Val d'Or, has reported progress in exploring what appears to be a large body of low to medium-grade copper ore. This new deposit has been tested by horizontal drill holes put out from the 1,260 and 1,410-ft. levels. Width of the new deep zone is reported at more than 800 ft., with possibly 10,000 tons per vertical ft.

★A promising gold discovery has been reported in Northwestern Quebec by **N. A. Timmins (1938) Ltd.**, near Capsisit Lake, 18 miles north of Bachelor Lake. Diamond drilling is to start next spring. Coarse gold has been uncovered along a 2.5-ft. vein that is exposed at intervals for a total length of 1,100 ft. West of this structure some 300 ft. is a parallel vein within a wide shear zone that also has visible gold.

★M. A. Thomson, president of **Malartic Gold Fields, Ltd.**, reports the mill rate has been stepped up during the past year from 1,410 to 1,600 tons daily. Objective is 1,700 tons. A heavy program of development work is now in progress.

★The Eldona property, adjoining east of the Donalda which is crossed by the important Horne Creek fault. Geological conditions are reported favorable for ore deposition and the 192,000-ton block of ore has been developed from the 500-ft. level down to the 1,000-ft. horizon. From 1,150 ft. to the bottom level at 1,450 ft. the main ore zone is pyrite, the gold-silver-zinc values having disappeared. Exploratory drilling is to be carried out on the 850-ft. level from a drift now being prepared southwest of the shaft.

★**Barnat Mines Ltd.**, which combines the Sladen and National Malartic properties west of the town of Malartic, reports monthly recoveries increased from $51,000 in September to about $80,000 in November, when the average grade was shown at $4.54 per ton in gold. Operating costs amounted to $4.21.

Higher-grade ore in the National section has led to plans for deepening the shaft below the present bottom level at 1,250 ft., where the grade has been running better than $11 per ton. Good values up to 1 oz. have been developed in diorite on the 725-ft. level.

★J. A. O'Brien, president of **O'Brien Gold Mines**, Cadillac township, reports that deepening the No. 4 shaft below the 3,000-ft. level had slowed underground development and stoping operations. Three new levels are to be opened down to 3,450 ft. Broken ore has been increased and ore reserves have been maintained by development.

★Waite Amulet Mines, four miles north of Noranda, reports that six diamond drills are continuing exploration. Last winter a new orebody was

intersected east of the Waite mine, where the No. 9 shaft is being put down. It will be several months before the new opening approaches the ore horizon. The flat-lying lens was traced laterally by the drill campaign last summer. Waite Amulet produces upwards of 1,100 tons daily leading to annual recovery of approximately $10 million from copper, zinc, gold, silver and pyrite.

BRITISH COLUMBIA

★**Reeves MacDonald Mines, Ltd.**'s zinc-lead property near Salmo, put into operation in the latter half of 1949, had a gross production value with the initial 500-ton unit from August to Dec. 1 of $220,000. With the mill producing in excess of 500 tons daily, it is more than paying its way.

A second unit, to bring the mill to a 1,000-ton daily rated capacity, is scheduled to go into production by July 1 this year, with a good chance the operation will reach a total of 1,200 tons.

★Revival of operation under lease is reported by **Galena Mining & Milling Co.**, which holds five claims totaling 195 acres near Silverton in the Kootenay district. The property has been idle for many years. Ore reserves are estimated at 10,000 tons averaging 8% zinc.

★The 11-mile road to Bellore Mines property in the Bridge River district has been completed. The new road gives access to several other prospects and opens up a well-mineralized area hitherto regarded as inaccessible. Bellore holds a group of 16 claims at the headwaters of Truax Creek. High-grade antimony-silver-lead ore occurring in a strong wide vein traced over 5,000 ft. has responded well to a preliminary development.

★The preliminary report of Dr. W. H. White, B.C. Department of Mines, has been issued on the Lucky Four group of claims, held under option by the recently-formed **Rico Copper Mines, Ltd.** The report says three main bodies of copper are exposed in the main zone, while the east showing, on the southern slope of the mountain, is probably a second deposit rather than an extension of the main one. No samples were taken from either showing.

★A limited development program is being carried on by a small crew at the Silverite property of **Exelda Mines, Ltd.**, near Sandon. The company is at present drifting on this vein and recently opened a small section of high-grade silver-lead ore in calcite. The company hopes to make a small shipment of high-grade ore to Trail Smelter soon.

★Society Girl mine at Moyie, south of Cranbrook, has joined customs ore shippers to the Trail smelter. M. Nicholson, veteran B.C. miner and leaser, has acquired the property and re-

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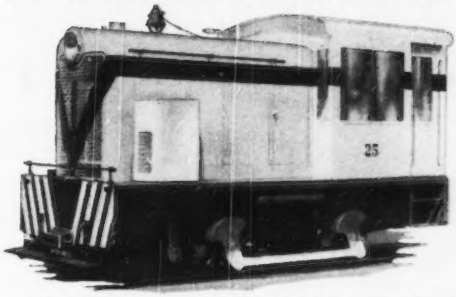

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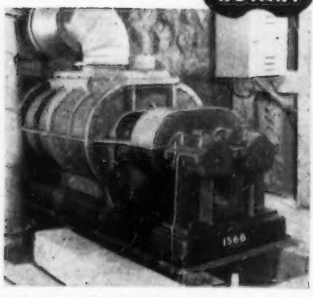

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British Columbia *(Continued)*

cently completed a program of reconditioning the underground workings in preparing for new development.

★Agreement between **Hedley Mascot Gold Mines, Ltd.**, and **Silver Giant Mines, Ltd.**, reported earlier *E&MJ*, Dec., 1949, p. 128) has been confirmed by W. G. Mackenzie, president of Hedley Mascot. The agreement, subject to approval of shareholders, provides that Hedley Mascot's 200-ton mill, in the Osoyoos mining division, will be moved and re-erected, with other equipment, adjacent to the Silver Giant property, 7 miles west of Spillimacheen.

★**Silver Standard Mines, Ltd.**, New Hazelton, with values in gold, silver, lead, zinc and cadmium, exceeding $50 per ton, reports costs are now about $11.50 per ton after all mining, milling, general and head office expenses, but before write-offs.

R. R. Wilson, president, in confirming the recent opening of 65 ft. of ore 3.6 ft. wide averaging $116 per ton on the No. 6 vein, bottom level, reports both faces of the orebody are continuing in even higher-grade ore. An open cut on the surface, 500-ft. slope distance above and 600 ft. south of this find, and an intersection on the 1,500-ft. level can now be correlated, indicating the block of ore and its extensions can be a major orebody. Observed dips on No. 6 and 7 veins indicate these will probably intersect below the present 1,300-ft. level. Because of opening of high-grade ore on No. 6 vein and improvement in ore grade in 900 stope on No. 4 vein, grade of ore going to the mill was up from the $38 per ton estimate to an average of $53 per ton in November.

★**Western Uranium Cobalt Mines, Ltd.**, has encountered values in uranium, gold and cobalt at its Victoria claims on Rocher de Boule Mountain near Hazelton.

A mineralized fissure was encountered, 4 in. wide, sampling 7.48 oz. gold and 4.19% cobalt, at 19 ft. in work at 5,900-ft. elevation seeking continuation of a high-grade oreshoot mined 200 ft. above by former operators. Intermediate band of hornblende carried values of 0.44 oz. per ton gold with 0.65% and 0.46% in U_3O_8 disclosed by assay. Second project is a new crosscut at 5,100-ft. elevation to investigate the downward extension of a cross vein which was stripped for 25 ft. on the surface.

★**Santiago Mines, Ltd.**, reports all reconditioning work at its Bosun mine in the New Denver area is completed, and new ore encountered on the 755-ft. sub-level has maintained strength and continuity. Drifting is continuing along the vein on the 755-ft. sub-level and arrangements are being made to sink the shaft an additional 75 ft. for a total depth of 820 ft.

★Completion of a new 286-ft. smoke

POTASSIUM MINE was a storehouse during the war, for these theatrical costumes of the Berlin State Theatres in Germany.

stack at the lead smelter of The **Consolidated Mining & Smelting Company of Canada, Ltd.**, marks a further step in the progress being made in Cominco's $12,000,000 smelter revision program. The stack, built of reinforced concrete, was erected by the Consolidated Chimney Corp. of Chicago. Work began Sept. 20 and the last concrete was poured on Nov 19.

★Despite objections of fisheries interests, **Aluminum Company of Canada,** will get a Government license to develop the vast water power of the Nechako and Nanika Rivers in B.C.'s Tweedsmuir Park for establishment of a projected $500-million aluminum refining industry.

★Sixty-one miles of new highway from Jakes Corner to Atlin, linking Whitehorse, Y.T., with the B.C. center, have been completed and opened. The road was built by the Canadian Army, which will keep it open all year. Atlin is on 70-mile long Atlin Lake. The road will open up mining areas, as well as providing access to fishing grounds, big game hunting.

★Latest level to be opened by **Island Mountain Mines, Ltd.** is yielding a good grade of both limestone replacement and quartz vein types. Initial work at 2,700-ft. elevation has opened a quartz vein for 55 ft. with one end still in ore. Less than 100 ft. from this vein a 35-ft. long replacement-type orebody was found with the drift for this distance averaging 2.5 oz. gold per ton.

★**Silbak-Premier Mines, Ltd.**, Portland Canal, has made first shipments of concentrates and 250 tons of zinc. Initial shipments totaled 500 tons of lead concentrates and 250 tons of zinc. Values are still chiefly in gold, with sizeable silver, lead and zinc content. The mine attained a three-shift milling basis early in December and is handling about 250 tons daily.

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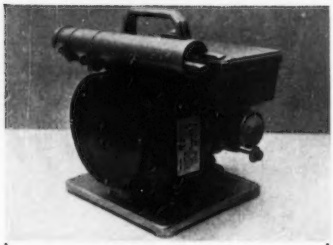

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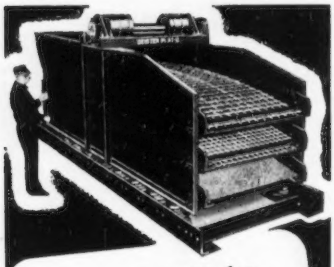

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IN LATIN-AMERICA

• Mexico Keeps Grip On Uranium

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MEXICO

★Fear of a general strike in the Mexican mining industry, like the one called in 1946, was allayed recently by the statement of Felix Ramirez, secretary-general of the miners' union, that his group planned to work on a company-by-company basis, rather than by industry-wide bargaining. He took this step after a long conference with President Miguel Aleman, during which, it is reported, Mexico's chief executive cautioned the union against any moves that would paralyze an industry so important to Mexico as mining.

★Ramirez said also that he had left with President Aleman for his consideration a set of union demands for such benefits as farms and equipment for sufferers from silicosis, more and better housing for all mining employees, increased benefits to cooperatives of employees. The union will press for wage increases as well as the other benefits.

★First bargaining move was made by the union against the **Cia. Minera Real Del Monte** in Pachuca. This great silver producer was turned over four years ago to Government control. It is operated by the Nacional Financiera, S.A., Via Carranza, No. 25, Mexico, D.F. The union has given Real Del Monte until Feb. 3 to grant demands for a 25% wage increase and several other benefits. This same union called a strike against the company back when it first went under Government control. This strike was broken by the Labor Ministry, and mining men are watching with interest the present attempt to combat the Government.

★At the request of the government of Hidalgo, the Bank of Mexico has sent economists and engineers to examine iron and coal mines at Zacualtipan. These were important producers at one time, but were closed by revolutionary activities about 35 years ago. The government of Hidalgo is trying to offset its declining production of non-ferrous and precious metals. It stands ready to help finance private operation of any iron or coal mines in the state. The Bank of Mexico, however, will have the decision on what is to be done and by what agency, private or Federal, it will be financed.

★The uranium control law, asked by President Aleman, has run into opposition from many prospectors who have hopes of developing uranium mines of their own. The law would place mining, processing, export, and all aspects of uranium handling in Government hands. An injunction against enforcement of the law will probably be sought on the grounds of unconstitutionality, the Mexican constitution having prohibited monopolies of all kinds. President Aleman considers the law necessary as a safeguard for the proper disposal of fissionable material.

★It is reported that uranium prospects in Chihuahua have been under Government supervision for some time, and mining is to begin sometime this year. Uranium has also been reported from Oaxaca, Guerrero, and other states. One such deposit was reported found in a mine in Guerrero near the village of Amtitlan, about eight hours' ride from the Balsas River. The mine is operated by Lic. Rafael Suarez B. Typical of the rumors bred by the current interest in uranium is the story published in newspapers in Mexico, D.F., that thousands of tons of earth have been taken from the Oaxaca deposits to be used as ballast in Russian ships returning to the Soviet. Experts point out that only negligible quantities of radioactive material could be obtained in this way.

★Stiffer penalties for illegally exporting gold in any form have been imposed by a new law, recently approved. The maximum rap is now 12 years with a fine of 100,000 pesos. According to President Aleman, illegal gold export is seriously cutting into Mexico's gold stocks.

★Production tax scales for silver that applied during 1949 will be extended to June 30, 1950. In announcing the extension, Ramon Beteta, Secretary of Finance, said it will enable mining companies, and other taxpayers, to calculate their 1950 costs with assurance. The Finance Ministry indicated that any further shift in the peso exchange rate between now and June 30 was unlikely.

ARGENTINA

★The **Depto. De Fomento Minero** of the **Banco De Credito Industrial** since its creation in 1946 has issued 276 loans to small miners totaling over 25,000,000 pesos. Most of this money has gone into exploration and development. This agency maintains a technical staff and laboratory in Buenos Aires.

★**L. M. Piccardo y Cia.** is enlarging its cyanide plant at Marayes. New

crushing equipment and agitating tanks will increase capacity and recovery. The Caledonia mine has shown up well in development, with high-grade ore continuing at depth. The exploration in the Morado district is also encouraging. All projects are hampered, however, by labor shortage and difficulty in importation of equipment.

★Sominer has discontinued its operations at Los Condores in San Luis. During the last war, this mine was the country's largest producer of tungsten concentrates. Reason for the shutdown was given as difficulty in securing essential supplies such as fuel oil, dynamite, and spare parts for machinery.

★Development of the Castano Viejo lead-zinc property in San Juan Province is well advanced. **National Lead Co.** is interested in the mine. It is reported that sufficient ore has already been developed to justify erection of a 200-ton mill.

★The University of Cuyo is preparing to hold a National Mining Congress for the three provinces of Cuyo sometime next May. Principal topic of discussion at the meeting will probably be the new National Constitution, which puts all kinds of mining enterprises under Government control.

★The new natural gas pipeline from Comodore Rivadavia to Buenos Aires is complete. This 12-in. pipeline is 1,050 miles long, and can carry 800,000 cubic meters of gas daily.

CHILE

★A rush to cash in on high gold prices has flooded the mills of the **Caja De Credito Minero** beyond capacity. The stockpiles of gold ores of this government agency now total more than 300 million pesos, making it difficult for the **Caja** to continue to meet payments for new lots of ore offered.

★**Cia. Minera Disputada De Los Condes** resumed work recently after a strike lasting several weeks. Agreement on a wage scale was reached only after intervention by officials from the Ministry of Labor.

★Operations at the **Braden Copper Co.'s** mines, mill and smelter continue uninterruptedly. Threat of a strike was allayed by an agreement reached recently on new wage scales and working conditions. The men will now work six days a week instead of five, and will get an increase of eight pesos a day for all employees. There will also be a special bonus of 10 pesos a day for night work, and an incentive bonus of four pesos for increased production. The agreement will run for 16 months, and will affect 16,000 men.

★**Lautaro Nitrate Co.** plans to spend about $4,000,000 on a new nitrate

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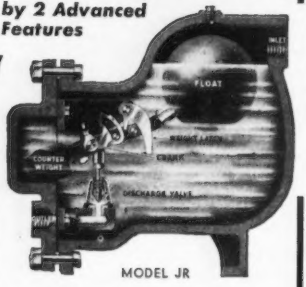

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Chile *(Continued)*

by July, 1950. The first unit, as planned now, will comprise four tanks or lagoons.

★The Mining Congress, organized by the Chilean Mining Association and the Chilean Mining Society, met in La Serena late in November. The meeting was attended by President Gonzalez Videla, several members of his cabinet, and by representatives of all branches of the Chilean mining industry. Resolutions approved by the Congress included appeals to the Government to: maintain the so-called Gold Law; properly finance the Mining Bank **(Caja De Credito Minero)**; merge all taxes now paid by mining companies into one grand tax amounting to 1.5% of the value of ore or concentrate sold; use Chilean silver for coinage; build an electrolytic refinery in Chile for copper from the new Paipote smelter. The Congress closed with a banquet offered the President and his party by Senor Fernando Benitez on behalf of the Mining Society of Chile. It was attended by some 300 delegates.

VENEZUELA

★Shipments of iron ore to the United States by **Bethlehem Steel Co.** from its El Pao deposit in Venezuela (See *E&MJ*, July, 1949, pp. 90-91) are likely to begin with the next rainy season, when the water level rises in the Orinoco.

★John G. Munson, vice president in charge of raw materials of the **United States Steel Corp.**, informed the House-Senate Economic Committee on Jan. 24 of the discovery of "an immense iron ore deposit in Venezuela." He said the **Orinoco Mining Co.**, a U. S. Steel subsidiary, has been formed to undertake development.

The discovery includes a mountain of ore, Cerro Bolivar, believed to be as large in tonnage as the famous Hull-Rust orebody on the Mesabi Range. The ore is of higher iron content than that in Minnesota.

U. S. Steel's exploration activities in this part of Venezuela were recounted briefly in *E&MJ*, July, 1949, pp. 90-91. In his testimony Mr. Munson said that photographs during an aerial survey of 10,500 sq. mi. indicated considerable outcropping. Exploration parties eventually found Cerro Bolivar and other large deposits. Rights for mining were obtained from the Government. The Corporation has since been diamond-drilling and tunneling the deposit, now known to contain a very large tonnage of iron ore running over 60% iron.

The Corporation's present problem, according to Mr. Munson, relates to the steps to be taken in developing the property and the methods to be used in bringing the ore to a coast port.

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IN AFRICA

• Devaluation Raises Profits
• Free State Still Booming

★Over-all costs in South African gold mines will increase about 10 to 15% as a result of devaluation, according to Robert Annan, in an address to shareholders of **Consolidated Goldfields of South Africa, Ltd.**, recently. Although a definite answer could not be given to the question of how devaluation would affect reserve tonnages, it seemed clear, Mr. Annan said, that a substantial increase in profits would result. The short-term effect of devaluation on mines in the development stage would, he felt, be severe because the increased cost of supplies and equipment would have to be met directly out of capital.

★**Glynn's Lydenburg, Ltd.**, is the first South African gold producer to announce re-estimation of its ore reserves as a result of devaluation. On Sept. 30, reserves were estimated at 106,890 tons averaging 6.49 dwt. over 19.2 in., against pre-devaluation estimates of 90,400 tons averaging 6.9 dwt. over 19.2 in. Before devaluation, it was estimated that profitable operation for this company would end during the latter half of the current financial year. Now, however, it is hoped to carry on for another year or two on the strength of the increased reserves developed by devaluation.

★A pilot plant began running in January at the Mpanda lead mine of Uruwira Minerals in Tanganyika. With a capacity of 100 tons a day, the plant makes use of the Sink-Float process. **Southern Minerals & Marketing Corporation, Pty.**, was recently appointed consulting engineers to Uruwira Minerals. Lloyd E. Daume, formerly associated with Bolivian enterprises, has charge of the consulting work with headquarters in Johannesburg. The Mpanda mine is one of the very few significant lead discoveries in recent years in the world.

★Idle for 17 years, the Jagersfontein diamond mine began running again in December. It has been re-equipped with up to date machinery at a cost of about £2,000,000. Sir Ernest Oppenheimer, chairman of **de Beers Consolidated**, said the company was determined to carry on at the mine despite any future fluctuation of the diamond market. Feature of the revived Jagersfontein mine is a 2,210-ft. conveyor belt, the longest belt south of the equator. A conveyor belt system, of which the foregoing belt is only a part, carries rock from the diamond pipe to the shaft, and from it to the washing plant.

★Up to $560,000,000 will be spent over the next few years in developing 13 new gold mines in the Orange Free State, according to Sir Ernest Oppenheimer, chairman of **Anglo-American Corporation**, in a recent statement. Referring to the task as the most extensive mining development the world has ever seen, Sir Ernest said that eight mines were now being actively developed in the Free State and five more were in the planning stage. Union Free State Coal and Gold Mines, Ltd., is the most recent applicant for a lease in the Free State. Sinking on the lease in the Harmony area will begin in June, 1950. Orders for two Ward-Leonard-type hoists have already been placed in the United States.

★Asbestos production was at a higher rate in the first eight months of 1949 than in 1948. Eight month's production of amosite was 27,472, compared with 30,372 tons for all of 1948. Blue asbestos production of 11,973 tons has already exceeded the full 1948 total of 10,909.

★The Rhodesian Iron and Steel Commission believes that 25,000,000 tons of iron ore exists in the North Hill section of its Que Que property. But several more boreholes will be sunk before this figure is verified. Members of the Commission feel that underground mining should be abandoned in favor of open-cut mining along a large face. Mechanical diggers should be used to reduce production and handling costs.

★At **Consolidated Main Reef Mines and Estates, Ltd.**, shareholders were told that the year's profit (ending June 30) was £225,260. Ore reserves were estimated at 4,175,000 tons averaging 3.7 dwt. a ton over a stoping width of 55.1 in. In addition, there were 1,233,000 tons of 4.2-dwt. ore in shaft and safety pillars.

★**West Dronfontein Gold Mining Co., Ltd.**, will defer sinking its No. 4 shaft to ensure that sufficient funds will be available for the completion of Nos. 1, 2, and 3 shafts and for the reduction plant to start operation.

First unit of the reduction plant with a nominal capacity of 25,000 tons per month should be operating early in 1952. Sufficient development rock probably will not be ready until later in that year to run the plant at capacity. A second unit of the same capacity should be ready in 1953.

Estimated depth of the Carbon leader in No. 2 shaft is about 4,500 ft., but it is expected to take more than a year to reach that depth. Sinking operations will be suspended at about 4,300 ft. to start development toward No. 1 shaft on the 12th level.

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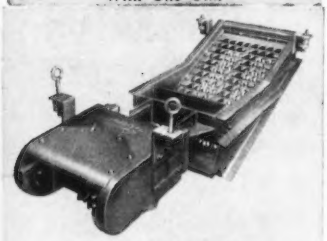

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IN AUSTRALIA

• Conservative Government Heartens Mining Industry

★Inauguration of the Menzies-Fadden conservative cabinet after eight years of labor government ushers in a period of respite from socialization that has been heartening to the mining industry. On the other hand, some uneasiness is felt over the new cabinet's intentions with regard to the exchange rate. Rumors have it that the Government's announced policy of "putting value back into the pound" may mean moving the Australian pound nearer parity with the sound sterling. A higher exchange value for the Australian pound would add to mining's burdens. Gold mines would lose the advantage gained by devaluation, and would probably once more stand in need of a subsidy to keep going. Base metal mines could probably absorb the loss in export income if the Government lets them raise the domestic selling price of metals. The dual price system irritates metal producers as a control stratagem of the labor government, which they would like to see abolished.

★Net effect of the new government's policies should help mining. It is pledged to eliminate Communists from trade unions. It has promised to open the coal bottleneck, which has hindered transport and smelting. It has promised increased gasoline supplies. It is committed to tax reform to some extent, and there is hope of obtaining special recognition of the problems of mining companies.

★The new government is also likely to resume negotiations with the United States to find means of gaining at least partial exemption from income tax for American firms operating in Australia. Profits of such companies are now taxed twice, once in Australia and once in the United States. Negotiations to prepare a pact similar to those between the U. S. and Great Britain, and Australia and Great Britain, broke down early in 1949.

WESTERN AUSTRALIA

★Stockholders of the London-registered **Gold Exploration & Finance Co. of Australia, Ltd.**, decided at an extraordinary meeting to place the company in voluntary liquidation. In exchange for Gold Exploration scrip, they will get stock in **Western Mining Corporation**, which is controlled by the Gold Mines of Australia-Western Mining group. It is believed that the move is a hedge against possible rise in value of the Australian pound in terms of sterling, which would thus benefit stockholders whose funds had been transferred from London. Australian investors also get more attractive tax treatment.

★Western Mining's principal operating companies are Gold Mines of Kalgoorlie, Central Norseman, and New Coolgardie. At Central Norseman, the new north shaft on the Mararoa vein is complete to the 25 level, and ore is being hoisted. At the Princess Royal mine, belonging to Central Norseman, a traverse of three drill holes has indicated another substantial ore shoot. It is proposed to sink a new inclined shaft to a slope depth of 1,200 ft. to reach this new ore, which runs from that level to within 375 ft. of the surface.

★Western Mining has taken an option on the Mount mine at Widgiemooltha, to be developed in association with Central Norseman. Ore will be treated in the Norseman mill.

★The Barbara section of New Coolgardie has disclosed good ore at 200 ft. The main shaft has been sunk to this depth and crosscuts are under way. Shaft sinking will continue in both the Barbara and the Surprise sections.

SOUTH AUSTRALIA

★Commenting on a reported uranium find in the Franklin Harbor district, Dr. K. R. Miles, senior geologist of the South Australian Mines Dept., said that the deposit had been known since 1923 and that there was little of great commercial value in the area.

VICTORIA

★Victorian gold yield for October, first post-devaluation month, was 5,881 oz. Production in October, 1948, was 6,656 oz. Also from comparison with the returns for August and September, 1949, it is apparent that devaluation has as yet caused no marked upswing in gold output.

★Depletion of gold in the rich Victory lode of **A-1 Consolidated** at Gaffney's Creek has caused a sharp drop in output and profits. During the year ended Aug. 1, 10,993 tons of ore was treated for a return of 8,190 oz. This compares with 12,333 tons for 22,551 oz. in the preceding year.

★Owing to devaluation and the increased gold price, **Cooks Eldorado Gold Dredging** has decided to dredge ground that would otherwise have

1950 . . .
Our Industrial Machine Is Running Down

In his recent Economic Report to Congress President Truman chalked up a constructive advance in his economic reasoning. He pointed out that if we are going to attain the worth-while goal of a $300 billion national income in the next five years, we must equip ourselves with more and better industrial tools. Of all the dynamic forces of expansion in America, he said, one of the most important is business investment.

That is fine. It is basic common sense. We have been saying that for years and we are glad to hear the President say it too.

But having hit this new high in his economic reasoning, the President failed to draw the right conclusion. He made the mistake of accepting the false conclusion that there is no shortage of business funds to pay for more and better industrial tools. "There are immense opportunities for business investment in nearly every segment of the economy," the President said, and further, "there are in general sufficient funds available to businessmen who want to seize these opportunities."

That just is not so — and the lack is not only serious; it can well be fatal.

It is a matter of the most urgent national importance that the President's recognition of the need of more and better industrial tools should be followed by effective action. *That calls for changes in the national policies that are now blocking and, unless changed, will increasingly block business from meeting this need. If business cannot get enough new tools, the result will not be higher, but lower standards of living five years from now.*

The President should talk this matter of business investment over with Senator O'Mahoney, the Chairman of the Joint Congressional Committee on the Economic Report. Senator O'Mahoney would take to the discussion knowledge of the investment situation recently acquired through his conduct of a series of Congressional hearings.

If he told the President what he told the press during the course of these hearings, he would say, "the private capitalistic system is being seriously threatened by a lack of venture capital." That is in direct conflict with the President's conclusion that "there are in general sufficient funds available."

This serious shortage of adequate investment in new plant and equipment is brought forth so that all of us can understand it by McGraw-Hill's annual survey of American industry's plans for investment in new plant and equipment in 1950, which has just been completed.

continued on next page

BUSINESS' PLANS FOR 1950

These are the major findings of the McGraw-Hill survey of "Business' Plans for New Plants and Equipment" in 1950. Made by the McGraw-Hill Department of Economics, the survey shows:

1. Industry—as represented by manufacturing, mining, transportation, and utilities—now plans to invest $12.4 billion in new plants and equipment this year. This is 13% less than was actually spent last year.

2. Manufacturing industries alone plan to spend $6.3 billion in 1950 for new facilities. This is also 13% less than they spent last year.

3. Manufacturers as a whole expect their 1950 sales volume to about equal 1949's.

4. Manufacturers will expand their capacity about 3% in 1950, under present plans. The largest part of their funds, 65%, will go to replace and modernize existing facilities.

5. Profits and reserves are expected to provide 92% of the 1950 investment funds of manufacturing companies. These companies count on new common stock issues to provide less than one-half of one per cent of the investment funds they will need.

6. Two out of three manufacturing companies review their investment plans monthly. Almost all companies go over them at least quarterly. The survey shows that companies changed plans rapidly during 1949 to meet changes in their prospects.

7. Other industries are also reducing their investment plans in 1950 by 13%. This coincidence arises from the fact that utility companies, notably the electric light and power companies, plan to spend only slightly less than in 1949. Railroads, on the other hand, are reducing their capital programs in 1950 by more than 40%.

A copy of a complete report on "Business' Plans for New Plants and Equipment" may be obtained by writing me at McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York 18, N. Y.

The results of the survey, which are summarized above, show that American Industry—as represented by manufacturing, mining, transportation and utilities—is planning to spend 13 per cent less for new plant and equipment in 1950 than it did in 1949.

Since the rate of investment in new plant and equipment right now is apparently about 15 per cent below the rate for 1949, the present level of business investment may be relatively steady in 1950. That would relieve the fear, expressed by President Truman in his Economic Report, that "if the downward trend in business investment were to continue, our prospects for full recovery and continued expansion would be seriously endangered."

BUT, at the rate of investment planned by American manufacturing industry for 1950, it would take 40 years to modernize thoroughly our present industrial plant and equipment. That would still leave undone the job of increasing it to meet the needs of an expanding economy of the kind sketched by President Truman in his message.

In attaining even this rate of investment, the McGraw-Hill survey shows American business must rely overwhelmingly on its own profits, which have declined as the country has left the postwar boom behind it. Most American companies cannot sell new common stock except at ruinously low prices. Here is one case where government action is really needed to help business and help to keep a rising American standard of living.

In order to get enough business investment to assure the "full recovery and continued expansion" sought by the President, our country needs:

1. Lower taxes on business income so as to release more money for new plant and equipment.

2. Liberalized depreciation allowances on old plant and tools so that business can buy new equipment faster.

3. Repeal of the present double taxation of dividends which now are taxed once as corporation income and again as personal income.

It is encouraging to have the President explicitly recognize the key importance of adequate business investment in providing steadily expanding prosperity. The next and most important thing to do is to make this recognition effective by discarding national policies which are blighting an adequate volume of business investment.

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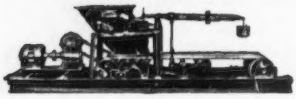

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Victoria *(Continued)*

been unprofitable, but which will now give another 12 months' life to the property.

TASMANIA

★**Electrolytic Zinc Co. of Australasia, Ltd.** closed its books for 1948-49 with a record profit of £1,069,000, after providing £500,000 for special depreciation reserve, £100,000 for ore depletion reserve, and £91,000 for taxation. Out of the net profit, £250,000 has been appropriated for plant and development at Risdon, and £17,000 for development at the company's West Coast mines.

★Zinc output for the year set a new record, although it dropped in the second half of the year owing to the coal strike. Even with coal supply back to normal, rail transport of concentrates from Broken Hill is still the bottleneck in zinc production.

★Domestic sales of refined zinc amounted to 57% of the total output during the year, compared with 67% the preceding year. Zinc sold in Australia brings 40 per ton, but the company gets 93 per ton for metal sold overseas.

★Further mechanization proposed by **Mt. Lyell Mining & Railway Co.** is expected to lift copper output to at least 10,000 tons a year. Two 4½-yd. shovels are on order at a cost of £120,000. To get at the mine's estimated reserves of 30,800,000 tons of ore running 0.68% copper, the company will have to move 11,300,000 tons of waste. Ore output in 1948-49 totaled 1,428,190 tons averaging 0.646% copper, comparing with 1,328,842 tons averaging 0.60% copper the previous year. Smelting was interrupted by a coke shortage, and blister copper production was only 3,871 tons against the potential capacity of 7,933 tons.

★**King Island Scheelite** reported a working profit of £93,000 for the year to October 31, compared with £109,000 the previous year. The lower profit was due to the sharp drop in the price of tungsten ore toward the end of the year.

QUEENSLAND

★Substantial improvement in over-all metal extraction owing to a new milling technique was reported recently by Mr. Kruttschnitt, chairman of **Mt. Isa Mines Ltd.** Lead recovery rose about 10%, silver by about 11%, and zinc by about 5%. The new technique, in developing which the mill crew was assisted by Mr. H. Hendricks, an American metallurgist, involves treatment of the flotation feed with sulphur dioxide gas.

★Although Mt. Isa paid the State Railways more than half a million pounds last year for haulage of zinc concentrate, the railroad was unable to carry all the mine's output and thereby reduced the company's earnings. Stocks of concentrate at the mine rose from 46,708 tons to 60,249 tons as a result of the railroad's inability to handle them.

★Queensland's gold output should receive a boost following resumption of work at **Dittmar Gold Mines,** 16 miles southwest of Prosperine. Opened a few years before World War II, the mine closed in 1947 after having produced 52,250 oz. of gold, about 300 tons of copper, and more than 30,000 oz. of silver. With ore running about 5 oz. to the ton, the gold mine was one of the richest in Australia. A new mill, including flotation and cyanidation, has been built.

NORTHERN TERRITORY

★Fresh capital will be sought to continue the second phase of development on the Tanami gold field. The companies involved are the **Lady**

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Claire Underwriters, N. L., Lady Claire Gold No. 1, and Lady Claire No. 2. The program calls for further sinking and equipping of the main shafts, driving, crosscutting, and other work on at least two levels, and general preparatory work. Diamond drill exploration remains to be done, and a mill must be planned and built.

NEW GUINEA

★Disaster overtook one of **Bulolo Gold Dredging's** two deep-digging dredges on Nov. 22 when a slough from the face of the cut set up a huge wave that capsized the dredge. The crew escaped. The dredge is insured in the United States for $1,200,000, but the possibility of salvage is considered good.

★**Pato Consolidated Gold Dredging, Ltd.,** in the eight months of 1948 from May to Dec. 31, handled a total of 11,348,000 cu. yd., recovering 52,249 oz. fine gold, valued at $1,828,715 (gold $35 U. S. per oz.). For the nine months to Sept. 30, 1949, output was 12,645,300 cu. yd. and recovery 96,304 oz., valued at $3,370,640.

NEW ZEALAND

★The Dominion, in 1948, produced 93,903 oz. of gold, 232,563 oz. of silver, 4,776 tons of iron ore, and small amounts of antimony and manganese ores. Eleven gold dredges were running in 1948, but three shut down at the end of the year. **Kanieri Gold Dredging** and **Arahura Gold Dredging** each had over 3,000 oz. of gold on hand when devaluation came along. This netted each company an extra profit of about 44%. Normal output for each company is about 8,000 oz. a year.

FIJI

★The recent increase in the price of gold as a result of devaluation meant a welcome increase in revenue to Fiji's gold mines, although under the system of royalty payments in effect since midyear, by far the greater benefit will go to the government. All in all, about 50% of the gross profits of Fijian gold mining companies goes to the government in one form or another.

★To cushion the blow of taxation, **Emperor Mines, Ltd.,** instead of paying dividends subject to tax is returning portions of the paid-in capital to stockholders. **Loloma Gold Mines** has adopted a policy of investing disposable funds in Australian gold mines and paying dividends out of dividends returned on these holdings, profits from gold mining being exempt from taxation in Australia.

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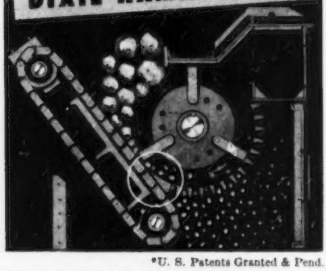

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IN ASIA

• Manila's Gold Market Shaken

• India Protects Aluminum

PHILIPPINES

★The flourishing free gold market in the Philippine Islands took a body blow on December 14, when the Central Bank issued an order directing that all locally-mined gold, or gold-bearing metal, in the hands of any person or corporation must be reported to the Central Bank and its disposition licensed. The ruling applies whether the gold is to be sold at home or abroad. If the sale is to an outside agency, the seller must deposit the foreign exchange proceeds of the sale to the credit of the Central Bank, who will then pay the seller in Philippine currency at its current buying rate.

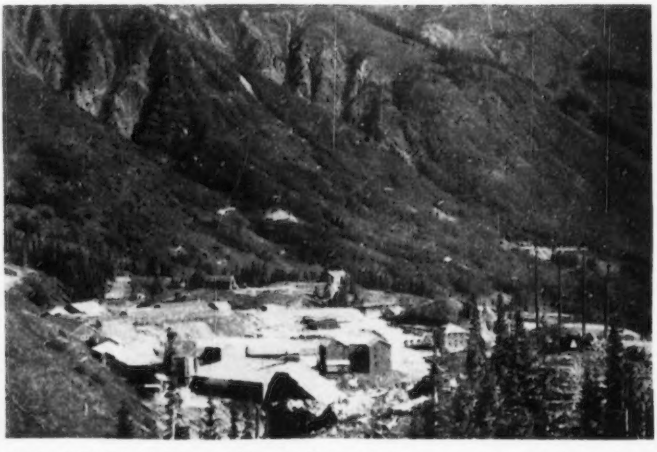
★If this ruling is strictly interpreted, it will end the free market in gold in Manila, where gold has sold at substantial premiums over the $35 rate since 1947. Just before the order came out, gold was selling at $54 per oz. Gold producers, rallying from the shock, pointed out that the Philippines was a member of the International Monetary Fund, and has therefore agreed not to grant licenses to export gold to countries where more than the $35 price can be had. However, gold mining in the islands has gained rapidly since the war largely because this restriction on gold sales has never been enforced for lack of a law requiring gold to be handed over to the Government.

★The new ruling doesn't say that producers have to sell gold to the Central Bank at $35, but miners are afraid that the Bank will call for that rate. If it does, marginal and low-grade mines will have heavy going. Total costs of the four principal gold producers in the Philippines in 1948 averaged $33.50 per oz. It isn't likely that 1949 costs will run any lower than that. Any drop in costs owing to milling greater tonnages will be more than offset by fringe benefit increases to workmen, as well as actual wage increases.

★Lack of demand for refractory-grade chromite ore caused suspension for November and December of mining at **Consolidated Mines.** Some ore was still being shipped from stockpiles, about 10,000 tons going to the United States in January. Sterling devaluation seems to have blocked further shipments to ports in Great Britain.

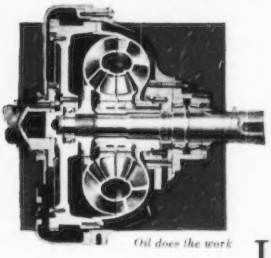
INDIA

★India's aluminum industry has been granted an additional three-year term for its 30% protective duty, by special act of the Indian parliament. In 1949, the two producing aluminum companies turned out less than 3,000 metric tons of the metal. Capacity of these plants is about 4,000 tons annually. The Government hopes to get production up to 3,500 tons this year.



MILL AND WORKINGS of Idarado Mining Co's Treasury Tunnel—Black Bear property near Ouray, Colo. The mine is opened by a 12,000-ft. tunnel.

Smoother Starts
Heavier Pay Loads
Longer Clutch Life
Lower Fuel Costs



Oil does the work

with GM DIESEL TORQUE CONVERTER

INSTALLING a General Motors Series 71 Diesel engine torque converter unit in place of a gasoline engine in this 5-ton Vulcan locomotive, Leslie Salt Company, Newark, California, gained the advantages of Diesel economy—plus high torque *without gear shifting* to move heavy trains of salt cars from evaporation ponds to washing sheds.

With the original power and a selective 4-speed transmission, clutch life had been short. Now the operator can start most loads in fourth gear—and have the smoothness of hydraulic drive plus fast getaway because of the GM torque converter's 3.6 to 1 torque multiplication at start.

Gear shifting is virtually eliminated. The GM torque converter *automatically* shifts to fluid coupling as the train gets up speed, giving maximum efficiency throughout the load range.

This is just one of the many applications where General Motors Diesel engine torque converter units are proving their ability to get more work done at lower cost. Before you buy or repower equipment, it will pay you to look into the advantages GM Diesel can bring to your operation. Write for catalog covering full details on design, operation and application of the NEW General Motors Diesel engine torque converter unit.

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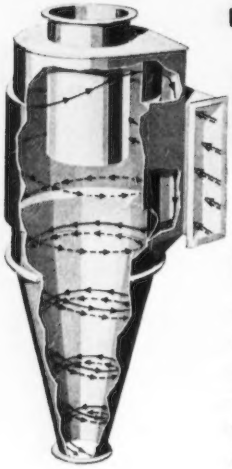
GENERAL MOTORS

GM GENERAL MOTORS DIESEL POWER

DIESEL BRAWN WITHOUT THE BULK

There's expert advice to be sought before tackling

Dust RECOVERY



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a foolproof formula that can be applied to all conditions. Each job requires individual engineering analysis... *by specialists.* Buell renders such a service, with no obligation to you. If a Buell Cyclone System can logically be recommended, it will be a tailored-to-the-job installation, of pre-measured and stated % efficiency. A Buell System naturally excells any ordinary cyclone, since it has the exclusive van Tongeren patented 'Shave-Off'. We invite your general or specific inquiry, and an opportunity to put service ahead of salesmanship. As a starter, let us send you the 32-page book, 'Engineered Efficiency'. Write: Buell Engineering Company, 70 Pine Street, Suite 5030, New York 5, N. Y.

buell Engineered Efficiency in DUST RECOVERY

NEW BOOKS

REFRACTORIES, NEW THIRD EDITION. By F. H. Norton, Professor of Ceramics, Massachusetts Institute of Technology, Consultant of Babcock and Wilcox Co. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. Pp. 782. Price, $8.50.

The new third edition of "Refractories" has been expanded and partially rewritten to keep apace with new developments in the refractories industry. Annual value of production of these materials has increased from $20 million to $80 million in the thirties, to $120 million to $160 million during the 1940 to 1946 period.

Sections on molding, plasticity, raw materials, firing, refractories for steel manufacture, and refractories for steam power generation have been practically rewritten.

New material includes non-plastic casting, hydrostatic molding, hot pressing, laboratory furnaces, properties of pure refractory materials, refractories for *nuclear power generation*, and refractories for *jet propulsion*.

PERLITE AND OTHER VOLCANIC OCCURRENCES IN WASHINGTON. By Marshall T. Huntting. Published by Washington Department of Conservation and Development, Division of Mines, Olympia, Wash. Pp. 77, Price, 25c.

Topics covered in the first portion of this pamphlet include: general description of perlite; thermal expansion; analyses of numerous glassy and crystalline volcanic rocks; origin of perlite; aids to prospectors; perlite occurrences in Washington with map; uses of perlite; tests for water content, specific gravity, index of refraction, silica content, and expansion. Approximately 50 additional pages describe occurrences of perlite in Washington.

FINANCIAL POST SURVEY OF CANADIAN MINES. Published by Maclean-Hunter Publishing Co., Ltd., Dominion Square Bldg., Montreal Canada. Pp. 400. Price, $2.

Information pertaining to major Canadian mining companies is presented under these headings: Head Office, Company, Outside Properties, Ore Reserves, Production, Directors, Capitalization, Dividends, Subsidiaries, and Interest in Other Companies. Other companies are described more briefly. Approximately 3,650 companies in Canada are listed. Other information presented includes Canadian mineral production statistics, principal milling plants in Canada, a professional directory, and 36 maps of important mining districts.

(*Continued on page* 182)

How to read with your eyes open for business!

Read the ads! Every issue of this magazine contains ads that offer valuable services and useful products by which your business may be run more profitably.

The time it takes to read all the ads is time well spent. One ad alone can pay off – by informing you of new developments and new sources of supply, by helping you do a more efficient job. For example, you may locate one machine that will cut your production costs, or step up your output. Or you may discover that the equipment you've been waiting for is now available.

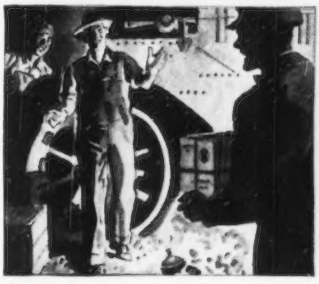
This magazine displays more ideas and merchandise than a trade exposition. Make every issue your buyer's guide. Read the ads as well as the articles. That's reading with your eyes open for business.

HEADQUARTERS FOR BUSINESS INFORMATION

McGRAW-HILL publications

Contractor saves penalty of $500 – by investing $3.84 in Air Express

Time clause in housing project paving contract stood good chance of being invoked when equipment broke down at 5 P.M. So 10-lb. carton of replacement parts was Air Expressed from 1200 miles away. Delivered in just 8 hours. The Air Express charge was only $3.84—and contractor completed job on time.



$3.84 is small indeed, since it covers door-to-door service. Anytime delivery, 7 days a week. Makes the *world's fastest* shipping service the most convenient.

Air Express goes by Scheduled Airlines; extra dependability, *experienced* handling. Shipments keep moving. Regular use keeps *any* business moving.

Only Air Express gives you all these advantages

World's fastest shipping service.
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SCHEDULED AIRLINES of the U.S.

Feed this unit *any* product with high filterability and it will show astonishing results in the way of capacity and, if necessary, washing efficiency. As is obvious, gravity aids the flow and the only vacuum necessary is that required to remove the liquid from the cake. Cakes even thicker than 4" are being handled.

The Oliver Horizontal Filter is flexible, too, particularly in its washing arrangement. If desired, varying strengths of wash liquor can be applied at desired points and different filtrate strengths removed individually and kept separate.

Cloth replacements are by individual sectors.

This Oliver Horizontal Filter is a worthy addition to the well-known standard metallurgical filters, Olivers, Americans and Dorrcos. It is the best design for taking care of certain metallurgical filtration problems. With areas ranging from 10 to 165 square feet—all high-capacity units—we can easily take care of your particular requirements. Bulletin No. 218 gives full details.

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BOOKS RECEIVED

The following publications may be obtained from Bureau of Mines Publications Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa.

R.I. 4602. Investigation of the Columbia Manganese Deposit, Campbell County, Va. By W. Bruce Montgomery. Pp. 7.

R. I. 4568. Relation Between Precision of Dust Counts (Light and Dark Field) from Simultaneous Impinger, Midget-Impinger, Electric Precipitator, and Filter-Paper Samples. By Carlton E. Brown and H. H. Schrenk. For dust-control and ventilation engineers who want to evaluate the precision of the above-mentioned dust-counting devices, this pamphlet should be a big help. Pp. 35, including seven tables of experimental data.

R.I. 4570. Flotation of Gray Iron Ores from the Talladega Area, Alabama. By H. G. Iverson. As a result of tests described in this pamphlet, the author concludes that flotation of iron minerals from ores in the Talladega area may be competitive on an economic basis with the roasting and magnetic separation treatment. Low reagent costs were cited as one reason. Pp. 18, including 10 tables of test data.

I.C. 7543. Mining Methods at the Brucite Deposit, Basic Refractories, Inc., Gabbs, Nye County, Nev. By George H. Holmes, Jr. Description of openpit mining method and tabulation of mining costs at a property producing about 500 tons per day. Pp. 10. plus 7 pp. illustrations.

R.I. 4612. Chloride Volatilization and Other Tests on a Gold-Copper Ore. By A. L. Engel and H. J. Heinen. Pp. 8.

R.I. 4616. Dense Medium and Flotation Tests on an Antimony Ore from California. By A. L. Engel. Preliminary concentration of a stibnite ore in a ferrosilicon medium followed by flotation proved to be the most practical method of extracting antimony concentrates. Pp. 6.

R.I. 4429. Missouri Valley Manganese Deposits, South Dakota. Part III Mining and Beneficiation Studies. By Paul Zinner and W. A. Grosh. The report concludes "There is no important market at present for the type of beneficiated product that might result from the application of the treatment methods described here. Balances between recovery and grade cannot be determined in the absence of specifications for a beneficiated product established by a market. Treatment procedures involving utilization of specialized jigging units as an initial part of beneficiation process seem to offer the best means of attaining the proper balance between recovery and grade." Pp. 56 plus 37 pp. of illustrations and flowsheets.

R.I. 4607. Investigation of the Harding Tantalum-Lithium Deposits Taos County, New Mexico. By M. Howard Berliner. Pp. 7.

Another BWH First!

NEW CONCORD #20 STEAM HOSE

(with Wire Braid Tube!)

BREAKS ALL PERFORMANCE RECORDS!

1. During grueling test, Concord #20 Steam Hose "took it" for 1980 continuous hours of service at 200 lbs. steam pressure!
2. No interruption . . . full flow of steam was maintained during the entire test period. Pressure remained constant at all times!
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6. Flexible and DURABLE . . . Your nearest BWH distributor will be glad to demonstrate the whip-like flexibility of Concord #20.

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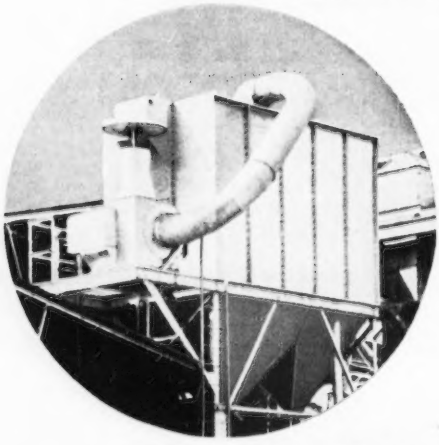
Dust and Fume Collection



★ Rugged

Widely used in zinc, lead, cadmium recovery and other smelting, rock product and mining applications, requiring heavy duty and continuous service.

★ Efficient

The multiple cylindrical bag construction with cyclic shaking and cleaning, adjustable for varying dust load without shutting down, has proved its ability to maintain an original, planned efficiency of collection as high as or higher than any other actually attained in practice.

★ Economical

Low cost of operation and of maintenance increase the economy of Norblo automatic bag type collection. Where dust salvaged has value, the equipment pays for itself in surprisingly short time. With the increasing necessity to prevent or minimize dust as a part of air pollution Norblo automatic bag type dust arresters offer an essential part of a satisfactory solution. Write for Bulletin No. 164-2.

The Northern Blower Company

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Automatic and Standard Bag Type Fume and Dust Collectors • Norblo Centrifugal and Hydraulic Collectors • Cement Air Cooling System • Exhaust Fans

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TO FIT ANY CAPACITY REQUIREMENT

Large or Small

For

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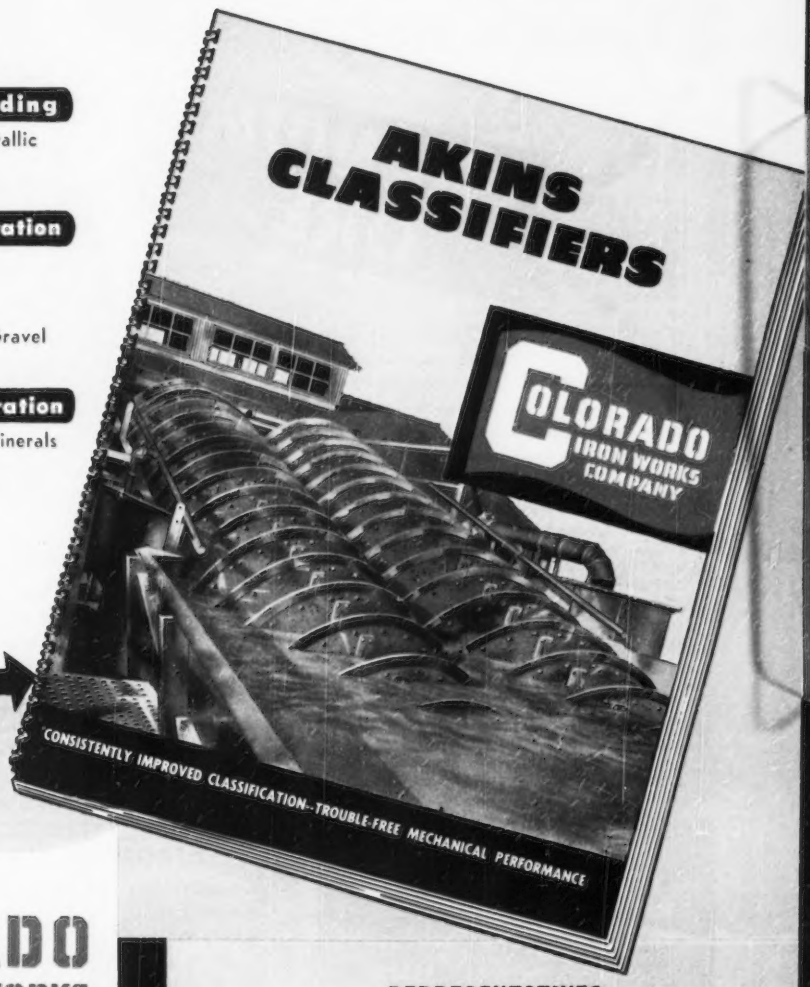
- Metallic and Non-Metallic Ores
- Cement

Washing and Concentration

- Ores
- Phosphate Rock
- Glass Sand
- Industrial Sand and Gravel
- Oyster Shell

Heavy Media Concentration

- Ores and Industrial Minerals
- Coal



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Here is the finest portable survey instrument made for tracking down elusive uranium ores. Of lightweight welded aluminum construction it weighs only 8¾ pounds, is completely waterproof and can be carried anywhere. A self-contained Geiger-Muller counter tube probe unit attached to the instrument by a 30" cable makes taking measurements in crevices and confined places an easy matter. Radiation intensities can be read in a few seconds directly from the indicating meter. Its three full scale ranges detect the most sensitive impulses, with instantaneous accuracy. Backed by 14 years of design experience, the SM3 is ideally suited to rugged use in the field without sacrificing any of the delicate sensitivity of laboratory equipment.

Outstanding Features:

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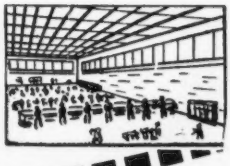


IT COSTS NO MORE TO HAVE THIS PROTECTION AT YOUR MINE . . . .

HAZAPRENE ZBF* SHEATH

Unequalled for Flame-Resistance — standard on all Hazacord Portable Mining Cables

HAZACORD Mining Machine Cables — Fine copper wires, Hazaloy coated or tin-coated for corrosion protection, provide a flexible, easy-to-handle cable. Long-lived, heat-resisting, Performite insulation over the conductors has an operating temperature of 75 C. This provides a safety margin of about 25% to withstand overload surges. Hazaprene fillers (not jute) are used to prevent wicking in of moisture through cable ends. Available in Twin-Parallel, Concentric or Two Conductor Round Types.

*ZBF
ZINC BORATE FORMULA

Flame tests have shown that Zinc Borate imparts greatly increased fire-resistant properties to neoprene compounds with burning rates reduced by as much as 20% and weight losses by as much as 40%. Afterglow is materially reduced also. Millions of feet of cable protected by this type of sheath were used during the war by the Navy for special operating conditions to gain extra fire protection. Hazaprene ZBF Sheaths mean not only greater safety because of unusual flame-resistance and lack of afterglow — but also longer life through increased resistance to abrasion, wear and tear.

IN more and more mines every day, electrical men are turning to Hazacords to gain the extra safety provided by the Hazaprene ZBF Sheath. This basic improvement developed by Hazard in neoprene sheaths has all the qualities important to long cable life — oil, water, acid and heat resistance, good flexibility combined with enduring toughness — *plus a resistance to flame never before obtainable.*

And under this Hazaprene ZBF Sheath, you'll find each Hazacord Mining Cable has its individual service-engineered features to assure — from every cable component — safe, trouble-free operation. For complete information, ask your Hazard representative or write Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

TYPE SH-A

HAZACORD Shovel and Dredge Cable — three separate conductors are individually protected with heat-resisting Keystone insulation and color-coded for quick, lasting identification. They are cabled together with Hazaprene fillers for extra flexibility and moisture tightness. A reinforced double layer Hazaprene ZBF Sheath provides over all protection, and, like all Hazaprene ZBF Sheaths, is pressure cured in a continuous metal mold for increased density and long life. Available in Types G, W, and Type SH, which has four different styles to best meet voltage pressures and operating conditions.

HAZACORD Flexible Cords (rated at 600 volts) for hand-held mine drills are protected with this tough, durable Hazaprene ZBF Sheath that withstands the most severe service. Hazacord's safety features have earned approval by law for underground mine use. Each is marked with Pennsylvania Dept. of Mines Approval P104 and more than meets their high standard of flame-resistance. Hazacords are also available in Type SO and SJO to meet every mining need for portable tools, appliances, drop lights, etc.

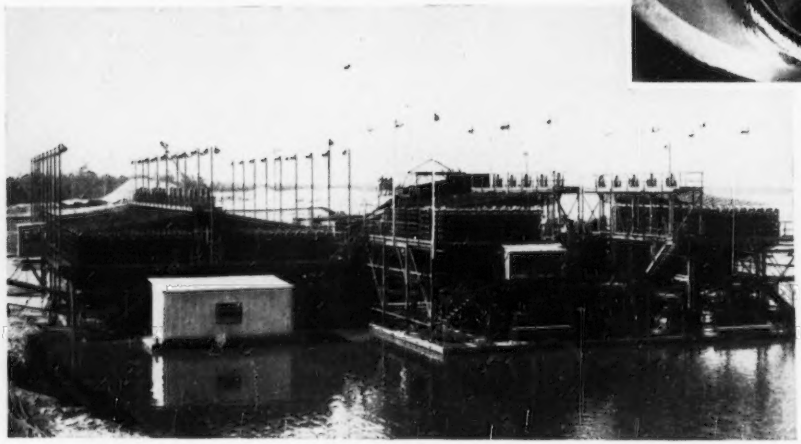
HAZARD

7474

insulated wires and cables for every mining use

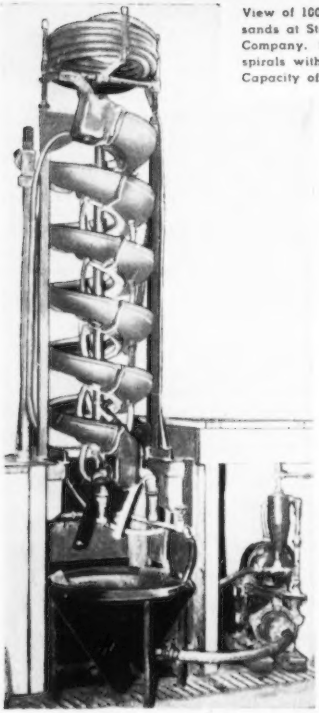
HUMPHREYS SPIRAL CONCENTRATOR

Low cost of installation • Low operating costs
No moving parts



Concentrating action Humphreys Spiral.—Note wide black band of concentrate entering upper outlet, which is set for a wide cut, also narrow black band of middling entering lower outlet set for thin cut. In cleaning fine coal, refuse and middling are discharged from the concentrate ports and cleaned coal follows the path shown as tailing above.

View of 1004 Humphreys Spiral Concentrators used for recovery of ilmenite, rutile and zircon from beach sands at Starke, Florida mine operated by Humphreys Gold Corporation for E. I. du Pont de Nemours & Company. Spirals are mounted on barges floating in dredge pond, one barge supporting 704 first stage spirals with pumps, another barge supporting 200 second stage and 100 third stage spirals with pumps. Capacity of 704 rougher spirals is 1100 tons per hour original feed.



Closed circuit test unit utilizing a full size spiral concentrator in Denver testing laboratory.

- ★ *for* separation of minerals of different specific gravity in ores at sizes generally minus 10 mesh.
- ★ *for* cleaning minus ¼ inch bituminous or anthracite coal.
- ★ *for* recovery of liberated values too coarse for flotation.
- ★ *for* recovery of values too fine to be economically treated by heavy-media separation.

HUMPHREYS SPIRALS have been used in full-scale plant operation for concentration of chromite, rutile, ilmenite and zircon from sands; for concentration of ground ores for recovery of lead and zinc; for concentration of molybdenum flotation mill tailing for recovery of tungsten; for concentration of fine iron ore; for separation of fine phosphate rock from sand; for cleaning minus ¼ inch coal; for concentration of pyrite from flotation mill tailing; for concentration of fine gold and gold bearing minerals; and for recovering mica and barite.

The installation, operating and maintenance costs of Humphreys Spirals are so low that economical concentration of materials which could not heretofore be worked at a profit, is now possible. There are no moving parts, no vibration, weight per unit of capacity is light and requires only a light foundation. Floor space per ton treated is very small.

A testing laboratory is maintained in Denver by the Engineering Division of the Humphreys Investment Co. Results obtainable in a full size plant may be determined by tests of a representative sample of minerals or coal weighing 300-500 lbs.

FOR DESCRIPTIVE BULLETINS, WRITE

THE HUMPHREYS INVESTMENT COMPANY
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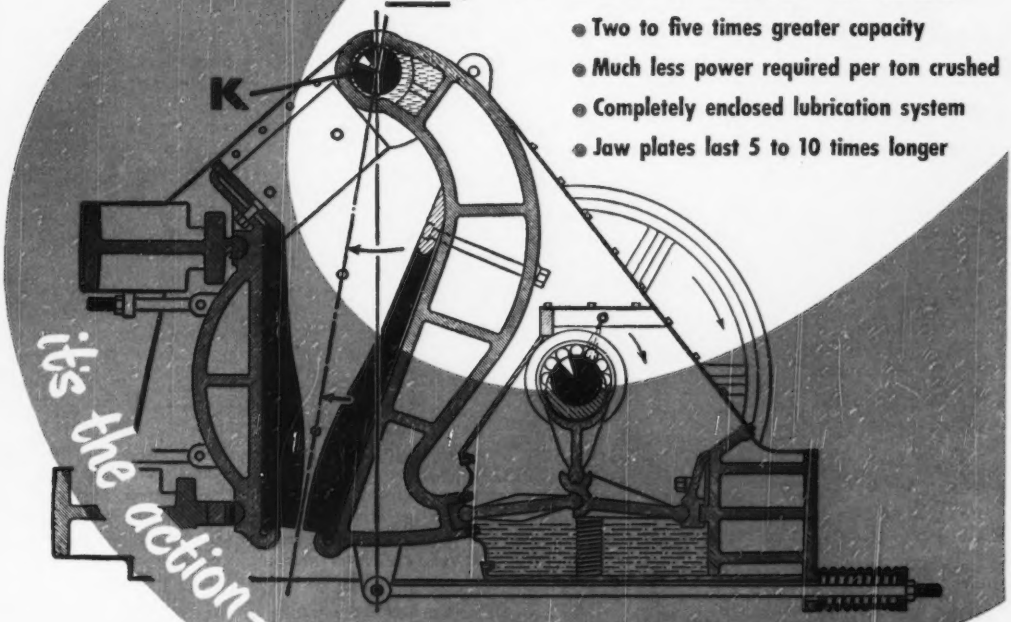
Look what you get

only in the KUE-KEN

- Two to five times greater capacity
- Much less power required per ton crushed
- Completely enclosed lubrication system
- Jaw plates last 5 to 10 times longer



the Free, Balanced Swing of the Jaw Plate that "Crushes Without Rubbing"

Blake or Double Toggle Crusher
(Designed 1858)

Note how swing jaw forces rock upward causing rock to rub against jaws (see arrows). This rubbing action rapidly wears jaw faces, increases the percentage of fines, and reduces capacity of the crusher.

Dalton Overhead Eccentric or Single Toggle Crusher
(Designed 1879)

Moving jaw forces rock both up and down (see arrows), causing a rubbing action that not only results in excessive fines, but causes heavy jaw plate wear and wasted power. Bearing pressures on this type are very high.

Here's real efficiency and economy—in (of all things) a *Jaw* Crusher! The massive swing jaw with plate attached swings freely on the large hinge pin "K" as a balanced pendulum. No great weight is lifted on the swing upward as in usual jaw crusher design. This results in substantial power saving and an action that crushes without rubbing, giving less fines and little wear on the jaw plates. Kue-Ken's swing jaw moves squarely against the rock, instantly gripping and crushing without forcing rock upward. Don't turn down a jaw for the job or select any other jaw crusher until you've investigated the Kue-Ken, the improved jaw crusher. Send for Bulletin 5012.

Exclusive eastern manufacturer and distributor, PENNSYLVANIA CRUSHER COMPANY, *Division of Bath Iron Works Corporation*, 1712 Liberty Trust Bldg., Philadelphia 7, Pa. Exclusive western manufacturer and distributor, STRAUB MFG. CO., 507 Chestnut St., Oakland 7, Calif.

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$25,000,000 Bull's-eye

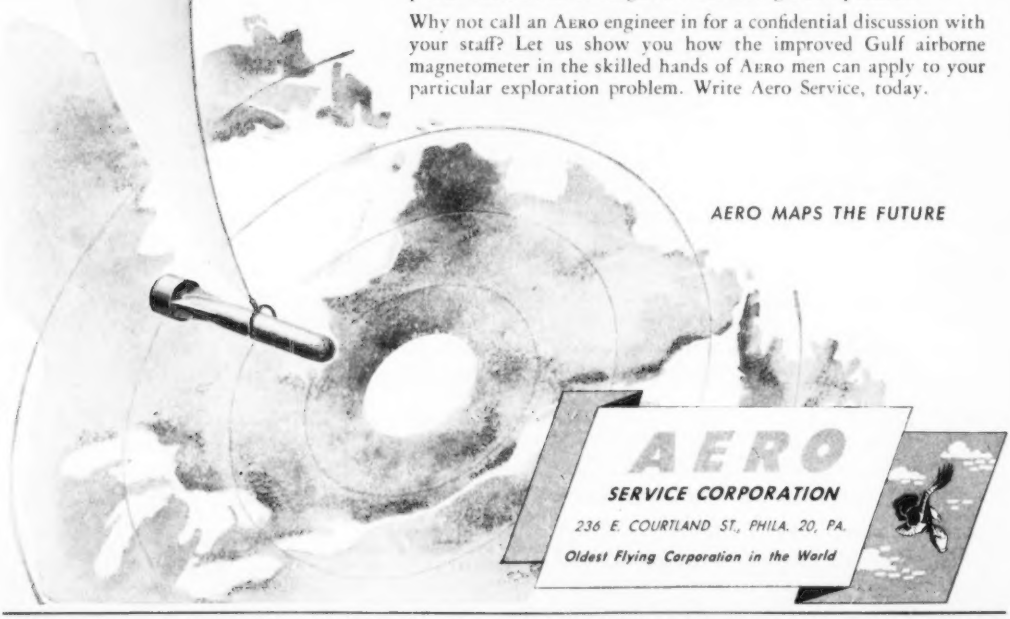
and now a new, improved airborne magnetometer

In 1947 Aero Service hit a $25,000,000 bull's-eye with one of the first commercial airborne magnetometer surveys ever made. In a few short weeks Aero's crew covered thousands of square miles and collected exact magnetic data that would have taken years to assemble by ground methods. Information recorded on this pioneer magnetometer study proved so significant that the mining company dispatched its geologists for ground studies in areas surveyed only 24 hours before. Based on the findings of this aerial survey, the company moved ahead with a multi-million dollar development program years earlier than their plans had contemplated.

Today, after three years and more than half a million square miles of successful aerial magnetic surveys in many parts of the world, *a better, even more accurate magnetometer is now available to the mining industry*. It opens new horizons in approaching mineral explorations.

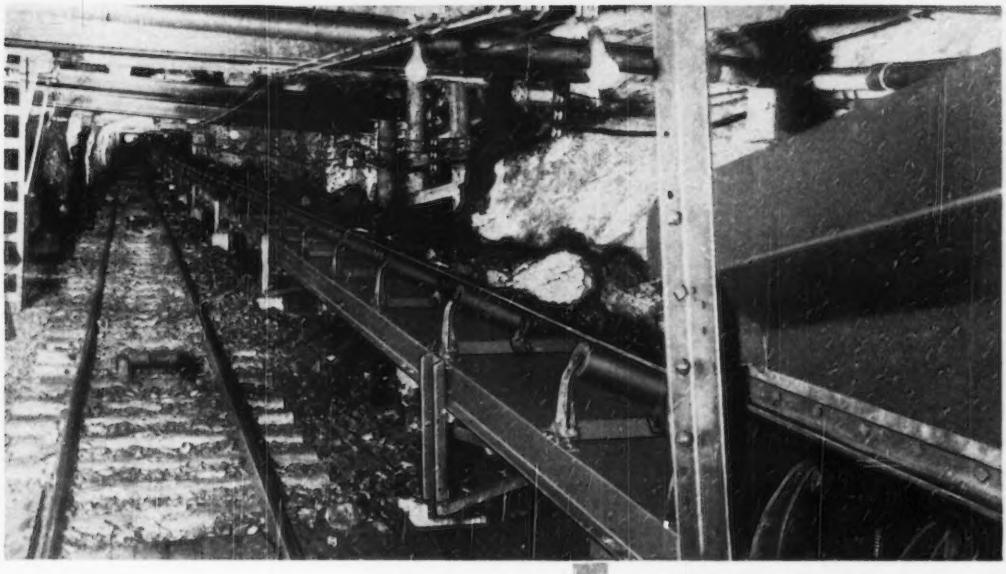
Developed by Gulf research ingenuity and tested in the field by Aero Service experience, the improved magnetometer adds a greater degree of certainty to the worldwide search for new mineral resources. It is essentially drift-free and capable of swifter response. As a result, it produces a more precise magnetic record, accurate to variations as small as 1 gamma. This information, translated into exact magnetic intensity maps by Aero, will furnish mining companies with the most accurate magnetic exploration guideposts ever made. For Aero's 30 years' mapping experience assures you of precise correlation of magnetic data and ground position.

Why not call an Aero engineer in for a confidential discussion with your staff? Let us show you how the improved Gulf airborne magnetometer in the skilled hands of Aero men can apply to your particular exploration problem. Write Aero Service, today.



TOPOGRAPHIC MAPS • PLANIMETRIC MAPS • PRECISE AERIAL MOSAICS • AIRBORNE MAGNETOMETER SURVEYS • RELIEF MODELS • COLOR PHOTOGRAPHY

12,500,000 TONS HANDLED...



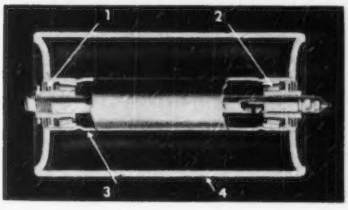
was just a start for Rex Idlers

You'd think that carrying 12,500,000 tons of material would be a lifetime job for any belt conveyor idlers. After these rugged Rex Idlers handled that amount of aggregate for the Shasta Dam as a starter, the same idlers were installed on the longest, highest belt slope conveyor in regular service. And they're still going strong.

That's real proof that Rex Belt Conveyor Idlers give you lowest cost service . . . that they eliminate costly down time caused by premature idler failures. Not only do Rex Idlers last longer, they also are easy on the belt. They eliminate destructive belt pinching and creasing, and absorb practically no power. Special application idlers, such as Rex Impact Cushioning Idlers illustrated above (lower right hand corner), installed under loading points, protect belt from laceration and carcass failures.

For the complete story on these cost-cutting idlers, mail the coupon for your copy of Bulletin No. 463R.

These Rex Quality Features Add Life to Your Conveyors



1 Triple labyrinth grease seal . . . dust stays out, grease stays in.

2 Tapered roller bearings, deadshaft type mounting, oversize capacity.

3 Unit mounting for bearings for positive alignment and minimum friction.

4 Heavy duty one-piece welded steel construction for maximum roll life.

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Milwaukee 4, Wis.

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☐ Send me my copy of Bulletin No. 463R.
☐ I would like to see a Rex Field Sales Engineer.

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Huge gears for every industrial use, also for the Army, Navy and other governmental services as well . . . that is our background for 58 years. Our modern plant contains the latest machines for designing, cutting, machining, hardening and testing every type of gear: Herringbone, Helical, Spur, Spiral-Bevel, Worm, Hypoid, Zerol, Internal, Intermittent, Racks and Pinions, etc.—large and small, in any quantity. That is why we have been known as "Gear Headquarters" for nearly 60 years.
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The New TELSMITH GYRASPHERE Crushers...

Send for Bulletin No. 274

TWO new MODELS

Style S—Standard
Style FC—Fine Crushing

Style S—Standard Gyrasphere has—

1. Longer Crushing Stroke giving greater capacity.
2. Larger Roller Thrust Bearings, both now located at top of eccentric.
3. More Eccentric Bearing Area in upper crushing zone.
4. Longer Springs to pass larger tramp iron.
5. New Location of Drive Gears for more economical operation.
6. Easier Accessibility for lower maintenance.
7. Available with either coarse or medium bowl.

Style FC—Fine Crushing Gyrasphere has these additional improvements—

1. New Feed Distributor for even feeding and a more uniform product.
2. Different Shape of Mantle and Concave with longer parallel crushing zone for finer product.
3. New Gun-Lock type mantle and concave holding devices — automatically self-tightening, easier to change.
4. More Springs for greater crushing pressures.
5. Available with either medium or fine bowl.

Y-9

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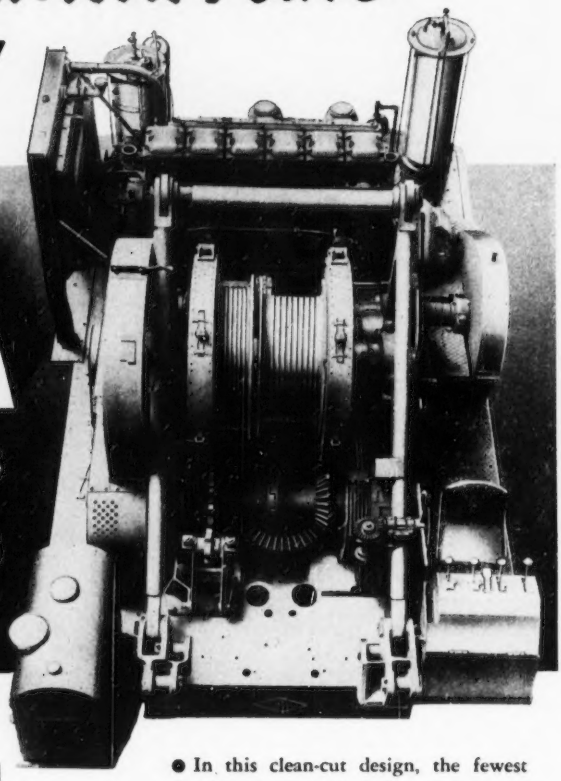
Built-in STAMINA *cuts* "DOWN-TIME"

of

LIMA

Shovels, Cranes and Draglines



EXAMINE THE MAIN MACHINERY AND YOU'LL UNDERSTAND WHY!

LIMA Type 1201 Shovel with 32½ foot boom, 22 foot dipper handle and 3½ yard dipper.

● In this clean-cut design, the fewest possible number of shafts are required to transmit power from engine to dipper. Important bearings, including those in the drum, are anti-friction type. Large drums increase output and minimize cable wear. Permanently aligned shafts prevent chattering and grabbing of clutches. Extra-rugged construction of machinery base, truck and front end equipment provides ample strength to withstand heavy loads. These are only a few of the reasons why LIMA machines are making records of outstanding performance with *minimum down-time.*

The LIMA line includes Shovels ¾ to 6 yards, Cranes to 110 tons, and Draglines Variable. Rubber-Mounted units are available with ¾ and 1 yard shovels and 35 ton cranes. Offices in principal cities of the world.

Lima Shovel and Crane Division

LIMA, OHIO

OTHER DIVISIONS: *Lima Locomotive Works Division; Niles Tool Works Co.; Hooven, Owens, Rentschler Co.*

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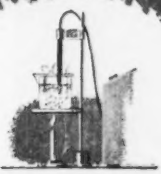
VIRTUALLY UNBREAKABLE!

So strong that the pH-sensitive bulb can withstand as much pressure as the thick stem itself!

Abrasion resistant—unusually rugged for long life and reliable measurement even in highly abrasive slurries!

Chemical durability—excellent in the strongest acids and alkalis . . . even at elevated temperatures!

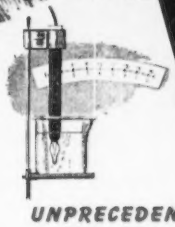


COVER EXTREME TEMPERATURES!

30° to 130° C at high pH—with the new high temperature—high pH glass.

—20° to 100° C—with the new general-purpose glass. Will withstand even repeated freezing.

Now- NEW BECKMAN pH Electrodes



UNPRECEDENTED pH RANGE!

0 to 14 pH—with the high-temperature high-pH glass . . . *only small reproducible deviation near extreme limits, even at high temperatures.*

0 to 11 pH—at room temperature and 0 to 10 pH at boiling for the general-purpose glass . . . *without correction for sodium ions!*

IMPROVED CONSTRUCTION!

Simplified, heat-resistant construction eliminates wax filling . . . retains patented Beckman internal shielding . . . increases measurement precision.

Only *Beckman Glass Electrodes* offer all of these features:

▶ **RAPID RESPONSE** . . . accuracy with speed and convenience.

▶ **STABILITY** . . . to match the high precision of BECKMAN pH METERS.

▶ **INTERNAL SHIELDING** . . . gives complete freedom from outside electrostatic interference.

▶ **INTEGRAL LEADS** . . . Continuous insulation into the electrode . . . connections located on protected panel board.

▶ **EXTREME TEMPERATURE RANGE** . . . Several types permit use from below freezing to boiling *and above!*

▶ **ENTIRE pH SCALE** . . . *Very small* sodium ion errors . . . e.g., with high-temperature high-pH glass, only 0.2 pH deviation at 13.7 pH in 1 N sodium hydroxide.

▶ **FACTORY SEALED** . . . rigidly tested . . . no maintenance.

▶ **UNIQUE CHEMICAL DURABILITY** . . . in alkali . . . in acid . . . in dilute solutions.

And . . . *REALLY TOUGH* . . . can even be used as a stirring rod!

These new electrode glasses are now being used in several Beckman electrode styles. As rapidly as possible, they will be available in the full line of Beckman Glass Electrodes.

Constant Research over the years has maintained Beckman Leadership in the instrumentation field . . .

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—***Beckman Ultraviolet, Visible and Infrared Spectrophotometers***
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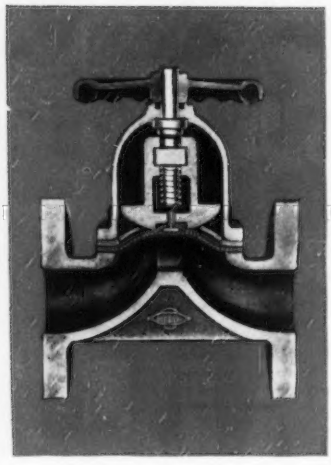
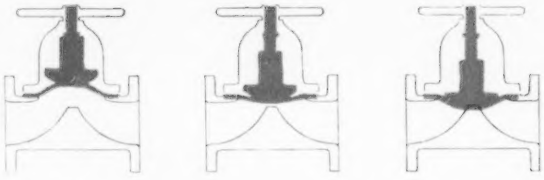
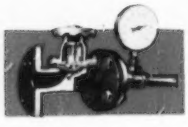


If you need a diaphragm valve you need all the advantages of diaphragm closing



Check these popular features of

GRINNELL-SAUNDERS DIAPHRAGM VALVES



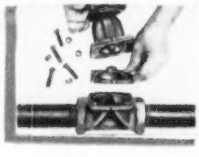
Diaphragm gives leak-tight closure against grit, scale, solid matter . . . Even when something as substantial as an 8-penny nail is trapped on the weir of a rubber lined valve, as illustrated, the resilient diaphragm, plus the large area of contact, gives leak-tight closure against pressure or vacuum.

Diaphragm lifts high for streamlined flow in either direction . . . Smooth, streamlined passage, without pockets, prevents trapping of sludge and reduces frictional resistance to a minimum—irrespective of direction of fluid flow. No disc holder in fluid stream. Grinnell-Saunders Diaphragm Valves are self-draining when installed with the spindle at 15 degrees above the horizontal position.

Diaphragm absolutely isolates working parts from fluid . . . There's no "if" about the way a continuous, one-piece diaphragm seals off the working parts from fluids; no perforation or puncture in the diaphragm where fluid or gas can possibly leak by the valve spindle. No sticking, clogging or corroding of working parts. Valve lubricant cannot contaminate the fluid in the line.

Diaphragm, body and lining materials to meet particular conditions . . . Bodies stocked in cast iron, malleable iron, stainless steel, bronze and aluminum: other materials on special orders. Valve bodies lined with lead, glass, natural rubber or neoprene. Diaphragm materials of natural rubber or synthetics. Working pressure, 150 lbs.; maximum temperature, 180°F.

Diaphragm is only part that normally wears and needs replacement . . . Depending on the type of service, it may last for years, particularly since the compressor and finger plate combine to support the diaphragm in all positions. The diaphragm can be replaced quickly without removing valve from line. No refacing or reseating. No disc holder to require tightening or replacing. No packing glands to demand attention.



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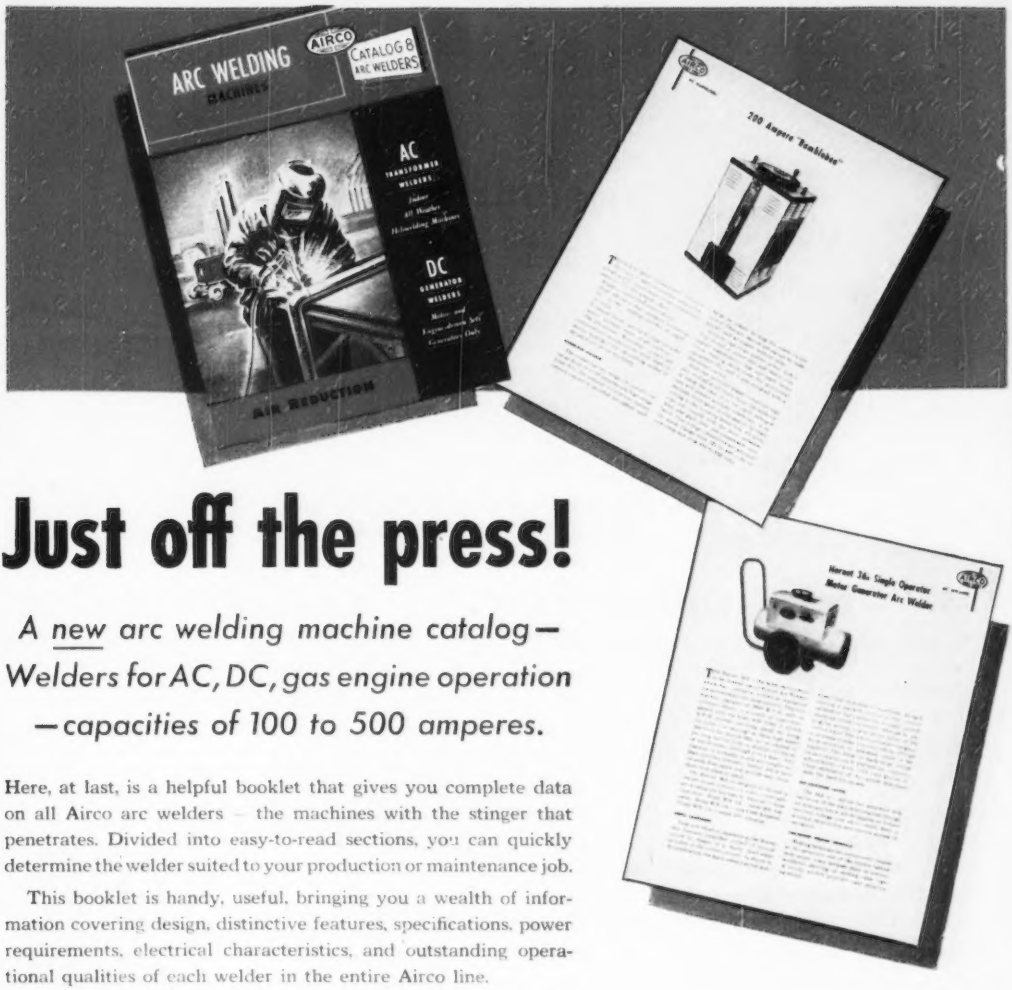

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This booklet is handy, useful, bringing you a wealth of information covering design, distinctive features, specifications, power requirements, electrical characteristics, and outstanding operational qualities of each welder in the entire Airco line.

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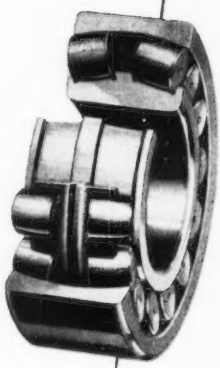
Remember leapfrog? How you used to have to skim over just right? Well, it's very much the same thing in specifying bearings. You don't want tolerances too great... and you don't want tolerances closer than the job demands. But you want to be sure that tolerances are *right*... are *always* properly controlled... *always* meet established standards. SKF adheres rigidly to these standards. Ceaseless vigilance in every stage of production assures complete control of tolerance throughout the entire manufacturing cycle. You can always be sure that any SKF Bearing will exactly meet your requirements... and will meet them again and again. Never forget, either, that *tolerance control* is only *one* reason why SKF Bearings will help you build equipment which, through smooth, economical performance, helps develop greater acceptance for your product. SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.



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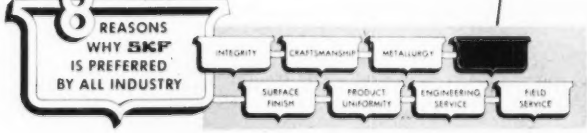


Inventors and Pioneers of the Self-Aligning Ball Bearing and Spherical Roller Bearing

7050

Compare the

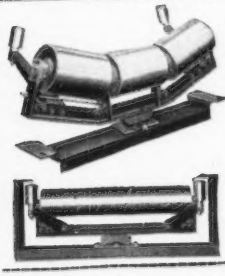
LINK-BELT "100"

Conveyor Idler Construction Features

Complete Line of Idlers

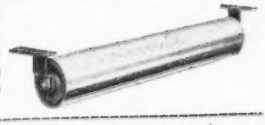
Troughing Idlers — illustrated above

Rubber-Tread Impact Troughing Idlers — recommended for use at loading points of the conveyor, especially when large lumps and heavy or coarse materials are being handled; to provide a cushion to absorb the impact of the material and protect the belt against bruising or tearing.



Positive Action Self-Aligning Idlers — for non-reversible belts. Should be spaced intermittently in both the carrying and return runs to automatically position the belt on the conveyor idler roadbed correcting misalignments due to off center loading, strong side winds, or unequal belt stretch. Counterweighted-Disc Self-Aligning Idlers for reversible belts are also available.

Return Idlers—have same smooth rounded-edge outer shell and interior construction as the troughing rolls, your assurance of an efficient return run with minimum belt wear.



Rubber Tread Return Idlers — for use when handling a wet or sticky material that clings to the belt, as these idlers induce a bending or kneading action to the belt which breaks the material loose. Also ideal for use when handling a material that has a corrosive action on iron or steel.

Link-Belt builds many types and designs of idlers for special services in addition to those illustrated. Refer your belt conveyor idler problem to Link-Belt for sound solutions.

For more than half a century, the name LINK-BELT has stood for pre-eminence in belt conveyor idlers and accessories. The original design has been steadily improved and now the Series "100" Idler offers top quality in this type of equipment. Installations have been made throughout the world and include some of the widest, the longest and the highest belt conveyors.

Link-Belt idlers offer such outstanding features: grease-in-dirt-out seal . . . rolls with smooth rounded-edge outer shell to minimize belt wear . . . high-grade roller bearings . . . interlocking nut and yokes to prevent brackets from spreading under unusual impact . . . end brackets of tough malleable iron are riveted to and extend well beyond the rigid T section cross member to provide stability and transmit load directly to steel bar feet which are welded to each end of the cross member . . . grease fittings for rolls are protected within the deep outer ribs of the end bracket and provide a convenient and safe means for lubrication.

Idlers can now be shipped from stock—full details on Series "100" Idlers are shown in Book No. 1915. It should be on the desk of every engineer using belt conveyors. Address the nearest office.

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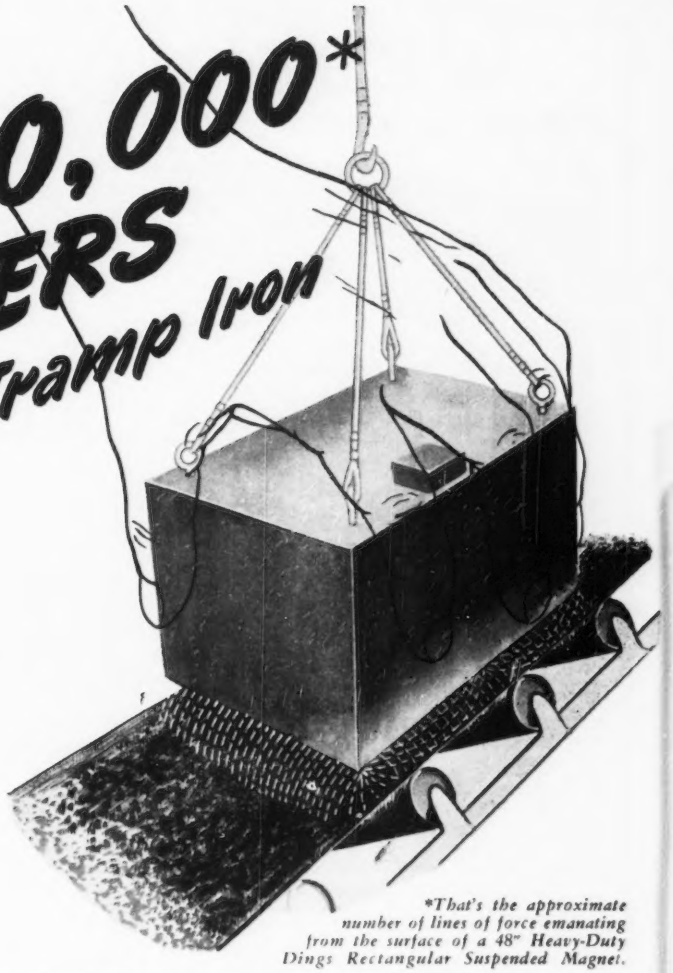
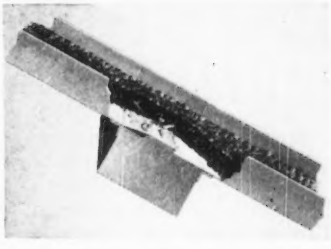


*That's the approximate number of lines of force emanating from the surface of a 48" Heavy-Duty Dings Rectangular Suspended Magnet.



The Dings Rectangular Spout Magnet is designed for installation in open or enclosed chutes to remove iron from dry materials or liquids such as coal, ore, rock, chemicals, foodstuffs, and other materials. As material flows over the magnet, iron is attracted and held securely below a step in the face against the downflow of material.

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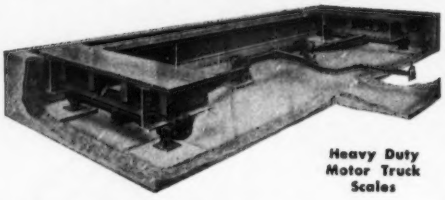

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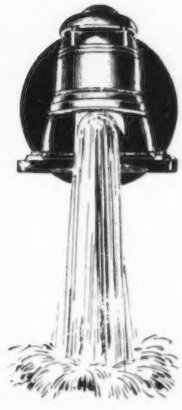

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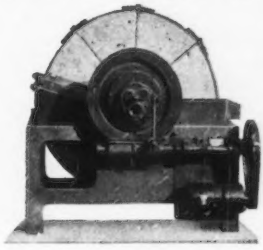

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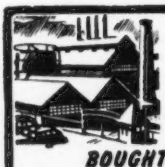

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ALPHABETICAL INDEX TO ADVERTISERS

Where an asterisk * precedes manufacturer's name, more detailed information may be found in the *1949-1950 edition of the Mining Catalogs*

Aero Service Corporation 190
*Air Reduction 197
*Allen-Sherman-Hoff Co. ..... Second Cover
*Allis-Chalmers Co. 7, 17, 44, 56
American Brass Co. 64
*American Brattice Cloth Corp. 171
American Cable Div. American Chain & Cable ..... Third Cover
*American Manganese Steel Div. (American Brake Shoe Co.) 30
*Atlas Car & Mfg. Co. 164
Atlas Powder Co. 6
Aurora Pump Co. 203

Baker Mfg. Co. 50, 51
Beckman Industries 195
*Bethlehem Steel Corp. 40
*Bird Machine Co. 133
*Black, Sivalls & Bryson 36
Boston Woven Hose & Rubber Co. 183
*Bucyrus-Erie Co. 12
*Buell Engineering Co. 180

*Card Iron Works, C. S. 172
*Carnegie-Illinois Steel Corp. 159
*Carter Products Corp. 203
Caterpillar Tractor Co. 10
Chain Belt Co. 191
*Chicago Pneumatic Tool Co. 14, 63
Christensen Diamond Products Co. 177
*Colorado Fuel & Iron Corp. 156
*Colorado Iron Works Co. 185
*Connellsville Mfg. & Mine Supply Co. 136
*Coppus Engineering Corp. 45
*Crane Company 34b
*Crucible Steel Co. of America 138

Davenport Locomotive Works 167
*Deister Concentrator Co. 157
*Deister Machine Co. 170
*Denver Equipment Co. 20
*Denver Fire Clay Co. 167
Detroit Diesel Engine Div. General Motors 179
*Differential Steel Car Co. 137
*Dings Magnetic Separator Co. 201
*Dixie Machinery Mfg. Co. 178
*Dorr Company 48
*Dow Chemical Co. (Great Western Div.) 16
*Dow Chemical Co. 57
duPont de Nemours & Co. (Inc.), E. I. (Explosives Div.) 27

*Edison Storage Bat. Div., Thos. A. Edison, Inc. 153
*Eimco Corporation 11
*Electric Storage Battery Co. 127
*El Tronics, Inc. 186
*Ensign-Bickford Co. 47

Federal Motor Truck Co. 175
Flexible Steel Lacing Co. 210

*Galigher Co. 24
*Gardner-Denver Co. 53
Gates Rubber Co. 34
*Gico 170
Goodrich Co., B. F. 4, 31
Goodyear Tire & Rubber Co. 21
Greensburg Machine Co. 156
Grinnell Co., Inc. 196

Hamilton Rubber Mfg. Co. 60
*Hardinge Co., Inc. 152
Harnischfeger Corp. 52
*Hazard Insulated Wire Works Div. of Okonite Co. 187
Hercules Powder Co. 62
Hillman Co., C. Kirk 202
*Humphreys Investment Co. 188

*Ingersoll-Rand Co. 3

*Jenkins Bros. 129
Johnson Co., C. A. 28, 29
Jones & Laughlin Steel Corp. 131
*Joy Manufacturing Co. 18, 19, 210

*Kennedy-Van Saun Mfg. & Engrg. Corp. 38, 39
Knapp Mills, Inc. 158
Knox Manufacturing Co. 160
*Koehring Co. 28, 29
*Kwik Mix 28, 29
Kysor Heater Co. 137

Layne & Bowler, Inc. 203
LeTourneau, Inc., R. G. 22, 23
*Lima Shovel & Crane Div., Lima Hamilton Corp. 194
*Link-Belt Company 199
*Longyear Co., E. J. 49

Macwhyte Company 55
McGraw-Hill Catalog Service 172
Merrill Co. 209
*Merrick Scale Mfg. Co. 209
Midwestern Engine & Equip. Co., Inc. 173
Mine & Smelter Supply Co. 46
*Morse Bros. Machinery Co. 210
*Mosebach Electric and Supply Co. 176
*Mott Core Drilling Co. 202

*National Filter Media Corp. 163
National Technical Laboratories 195
New York Engineering Co. 202
Nicholson & Co., W. H. 172
*Nordberg Manufacturing Co. 54
Northern Blower Co. 184
Northwest Engineering Co. 15

*Oliver United Filters, Inc. 182

*Parsons Co. 28, 29
*Pennsylvania Crusher Co. 189
Pennsylvania Drilling Co. 202
*Philadelphia Gear Works, Inc. 192

Railway Express Agency Air Express Division 181
*Roots-Connersville Blower Corp. 168
Ryerson & Sons, Inc., Jos. T. 136

*Salem Tool Co. 164
*Sauerman Bros. 171
Schaffer Poidometer Co. 176
Searchlight Section 204, 207
Sheffield Steel Corporation 165
*Simplex Wire & Cable Co. 25
*Sink & Float Corporation 58
Sintering Machinery Corporation 176
SKF Industries, Inc. 198
Smit & Co., Anton 210
*Smit & Sons, J. K. 169
Smith Engineering Works 193
*Sprague & Henwood, Inc. 162
Standard Oil of Cal. 65
*Stephens-Adamson Mfg. Co. 26
Stroh Process Steel Co. 61
*Sturtevant Mill Co. 35
Syntron Co. 174

[illegible] Company 8, 9
Thermoid Company 41
*Thomas Flexible Coupling Co. 154
Throwaway Bit Co. 32, 33
*Timken Roller Bearing Co. ..... 43 & Fourth Cover
*Traylor Engineering & Mfg. Co. 37

United States Rubber Co. 145
*U. S. Steel Subsidiaries 59, 159
*U. S. Steel Supply Co. 59

Victaulic Co. of America 135

Walworth Co. 42
*Western Machinery Co. 13
*Wedge Wire Corporation 172
Western Precipitation Corp. 147
*Wickwire Spencer Steel Div. Colorado Fuel & Iron Corp. Insert between pages ..... 34 & 35
*Wilfley & Sons Co., A. R. 66
*Willson Products, Inc. 161
Webb Corporation 202

Yuba Manufacturing Co. 155

PROFESSIONAL SERVICES 204

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT
Positions Vacant 204
Selling Opportunities Offered 204
Positions Wanted 204

SPECIAL SERVICES
Contract Work 204

BUSINESS OPPORTUNITIES
Offered 204

NOTICES
Proposal 204

PROPERTY
For Sale 204

EQUIPMENT
(Used or Surplus New)
For Sale 204-207
Surveying Instruments 204

WANTED
Equipment 204

ADVERTISERS INDEX

American Air Compressor Corp. 206

Baker Rendering Co. 204
Berger & Sons, Inc., C. L. 204
Basic Refractories, Inc. 206
Bernstein Bros. Machinery Co. 206

Carlyle Rubber Co., Inc. 205, 207
Cleveland Contractors Equipment Co. 204

Dulien Steel Products, Inc. 206

Eastern Magnesia Talc Co., Inc. 204
Electric Equipment Co. 206

Florence Machinery & Supply Co. 206

Heehs & Son, E. D. 207
Heineken, W. P. 207
Hercules Electric Machy. & Equip. Co. 206

Lefton Industrial Corp. 205

Morse Bros. Machy. Co. 205

O'Neill, A. J. 207

Panama Canal, The 204
Pierce Cable Co. 204

Saratoga Laboratories, Inc. 204
Smith Co., H. Y. 206
Smith, Paul F. 204
Stanhope, Inc., R. C. 207

Thompson Co., J. Parker 207

Universal Wire & Cable Co. 205

Wildwood Mining Co. 205

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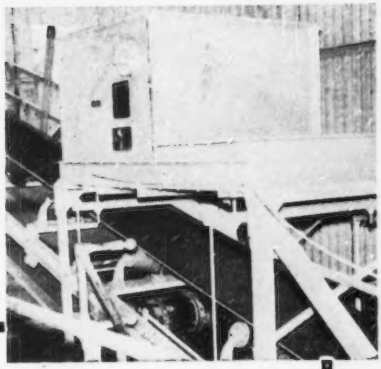

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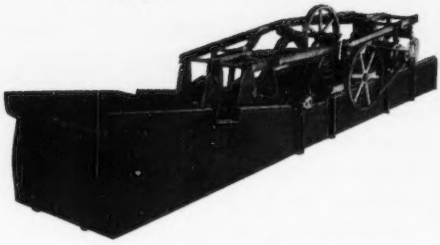

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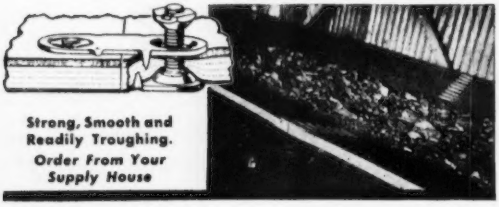

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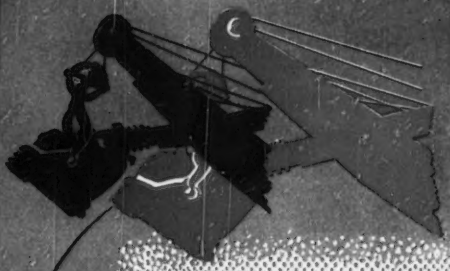

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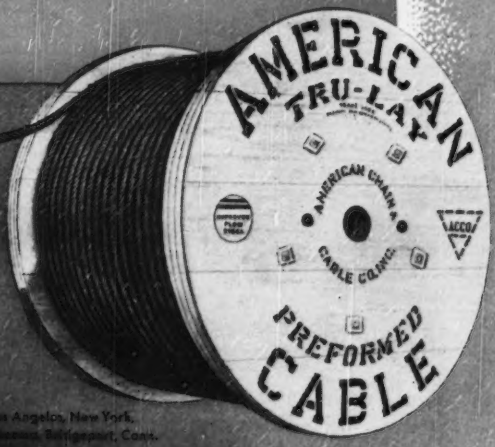

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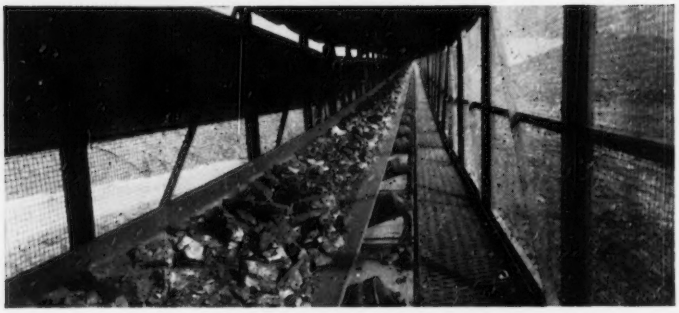
For heavy-duty conveyors . . .

IT'S TIMKEN . . .

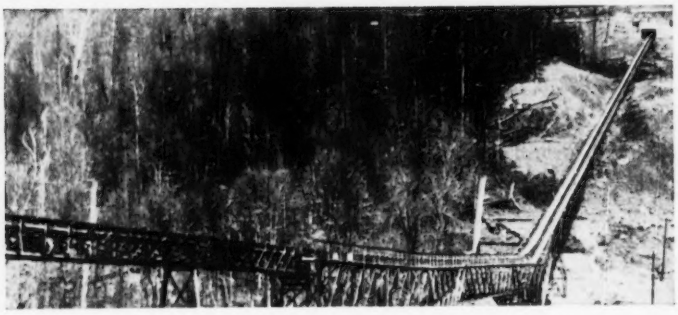


FOR over 25 years almost every heavy-duty conveyor—like most heavy duty equipment throughout industry — has relied on Timken® tapered roller bearings for long life and trouble-free performance. For example, The Blue Diamond Coal Company installed this Stephens-Adamson belt conveyor with 476 Timken bearing equipped idlers in 1930 —and at last report they haven't had to replace a bearing yet!

AND TIMKEN . . .

TIMKEN bearings are first choice for tough conveyor jobs like this Jeffrey Belt Conveyor installation used for long-distance sand hauling. Timken bearings provide maximum capacity for radial and thrust loads in any combination. Idlers turn freely, belt wear is reduced to a minimum. Effective seals keep lubricant *in,* dirt and moisture out. Lubrication and maintenance time is negligible.

AND TIMKEN® AGAIN!

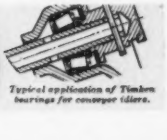


AND here's one of the latest Timken-equipped jobs—a 1,485 foot Robins conveyor at The Gauley Mountain Coal Company's Williams River Mine. It's another addition to the thousands of miles of heavy-duty conveyors that roll on Timken bearings. There's no other bearing with so much to offer, no other bearing so fully proved. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

Whenever the going's tough industry turns to

TIMKEN

TAPERED ROLLER BEARINGS



Typical application of Timken bearings for conveyor idlers.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ◫ LOADS OR ANY COMBINATION